

U.S. Department
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The **COAST GUARD** Journal of Safety
& Security at Sea
PROCEEDINGS
of the Marine Safety & Security Council

Summer 2011

The Marine Transportation System

Value to the nation

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U.S. DOT Secretary
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Chair
Committee
on the Marine
Transportation System

Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE 2011		2. REPORT TYPE		3. DATES COVERED 00-00-2011 to 00-00-2011	
4. TITLE AND SUBTITLE Coast Guard Proceedings. Volume 68, Number 2, Summer 2011				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Coast Guard, Proceedings Magazine, 2100 2nd Street SW Stop 7681, Washington, DC, 20593-7681				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 104	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

PROCEEDINGS



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CMTS Chairman's Perspective

by MR. RAY LAHOOD
*Secretary, U.S. Department of Transportation
Chair, Committee on the Marine Transportation System*

The United States is—and has always been—a maritime nation. For more than 250 years after Jamestown's founding, rivers, canals, the Great Lakes, and the oceans were the only practical ways to move large quantities of goods and people. Even today, most of our major cities and the majority of our population are located near our coasts.

The U.S. Marine Transportation System (MTS) is critical to the overall health of our nation's economy, including the creation of jobs throughout the country. It carries 78 percent of our international trade, and is one of the most efficient, effective, safe, and environmentally sound ways to transport people and goods.

America's "marine highways" have great untapped capacity to relieve congestion and wear-and-tear on our roads while enhancing highway safety, reducing carbon emissions, and increasing international trade. But in order to achieve President Obama's National Export Initiative goal of doubling our nation's exports between 2010 and 2015, the MTS will require our continuing commitment to ensure that our waterways and maritime infrastructure can handle the increased traffic.

The U.S. Department of Transportation actively supports the MTS in many ways through the efforts of the Maritime Administration and the Saint Lawrence Seaway Development Corporation. Over the last two years, the department has provided over \$215 million in port and marine highway investments through the TIGER (Transportation Investment Generating Economic Recovery) grants program, the most significant federal investment in port infrastructure in recent years. We also provided almost \$7 million in grants for projects under the Maritime Administration's new Marine Highway Grant program. Through efforts like these, the department is investing in our ports and waterways, facilitating trade, and educating the next generation of merchant mariners at the U.S. Merchant Marine Academy, which plays a critical role in training officers who operate our merchant ships safely and efficiently.

As chair of the Committee on the Marine Transportation System, I am proud of how the Department of Transportation collaborates with its many MTS partners, including the U.S. Coast Guard, U.S. Army Corps of Engineers, National Oceanic and Atmospheric Administration, and Federal Maritime Commission. Together we are working to make better use of the Marine Transportation System, and to help the nation realize its important benefits.

I would like to extend my thanks to the U.S. Department of Homeland Security and the U.S. Coast Guard for this edition of *Proceedings* and for highlighting the important efforts of those who help America prosper by helping marine commerce move forward.

ADM Robert J. Papp Jr.
Commandant
U.S. Coast Guard

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Washington, D.C. 20593-7681

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CMTS Coordinating Board Chair's Point of View



by Ms. MARGARET SPRING

*Chief of Staff, National Oceanic and Atmospheric Administration
2011 Chair for the CMTS Coordinating Board*

We owe our lives and livelihoods to the ocean and the waters that connect us. They nourish us, body and soul. They safeguard us, regulating our climate. They give us breath, generating half of our planet's oxygen. They improve our quality of life by providing food, energy, recreation, and lifesaving drugs. And they convey goods and people to the global community, serving as conduits for transportation, trade, and tourism.

Marine transportation quite literally drives the U.S. economy, and the way in which maritime commerce develops in the future will have a significant influence on the long-term health of our planet and its people. Well-planned maritime commerce can minimize harm to marine wildlife and reduce the nation's carbon footprint by moving freight with much less energy than other modes. However, without adequate preparation or attention to risk and hazards, marine transportation activities can result in loss of life, ecosystem harm, financial liability, and other costs.

We now have the opportunity to work together and chart a better course. In July 2010 President Obama reaffirmed that healthy oceans are everyone's business when he signed the National Ocean Policy and established the National Ocean Council. This policy recognizes the critical national importance of marine transportation to our prosperity, sustainability, and security, and names the Committee on the Marine Transportation System (CMTS), working with the National Economic Council, as an essential participant in the interagency and stakeholder process the president established.

I am very pleased to have the opportunity to serve as chair of the CMTS Coordinating Board for 2011, and to help lead the many efforts the board has underway to support national priorities, including those of the National Ocean Council. CMTS teams are actively evaluating Arctic shipping policy, ways to leverage technology to benefit marine transportation system operations, opportunities to increase efficiency along with environmental stewardship, and increasing the resilience of the transportation sector to hazards and climate change.

I also look forward to exploring how we can better guide marine transportation planning to improve our quality of life and steward our resources through initiatives such as America's Marine Highways. Now more than ever, our improved understanding of physical oceanography, marine biology, weather, and climate can inform how we use our oceans—without using them up.

I am pleased to champion this edition of *Proceedings* and hope you find that it provides some insight into the importance and complexity of one of America's critical links in our transportation infrastructure, the U.S. marine transportation system.



The U.S. Marine Transportation System

Federal responsibilities, funding, and coordination.

by MR. RAJIV KHANDPUR
Chief, U.S. Coast Guard Office of
Marine Transportation Systems

Mr. Rajiv Khandpur has been involved with the Committee on the Marine Transportation System since its inception and was one of the key members of the initial group of agency representatives who developed the charter and the governance guidelines. He is also largely responsible for organizing this edition that showcases the work of all the federal agencies that are actively engaged in the activities that support this valuable U.S. asset. His overview follows.

Navigating a “marine highway” or a waterway system is similar in many ways to traveling on an interstate highway. To travel on a highway, you need a vehicle that is safe and certified by the authorities; a licensed driver; a paved highway, with traffic lights and directional signage; a map to give you some idea of where you are going and to provide information about road signs; and perhaps a global positioning system unit to provide a “fix” along your journey.

Along the way, you might travel through tunnels or come across highway maintenance road crews. If you encounter snow and ice, snow plows will clear the roads and trucks may deposit sand or salt to make the cleared roads more navigable. So a simple highway journey from point “A” to point “B” can require a lot of manpower and physical infrastructure support.

All of these items have a parallel in the marine transportation system: The vehicles are the vessels that must pass safety inspections and be certified by the U.S. Coast Guard; the crews that “drive” these vessels must also be trained and licensed for the jobs they perform. The waterways around our rivers, harbors, and coastal areas must be dredged (just as the paved roads of the highway system must be maintained), and aids to navigation (traf-

fic signals) must be provided so that mariners can navigate safely without running into each other or running aground.

Perhaps the only component of the marine transportation system (MTS) that does not have a parallel in the interstate highway system are the locks, which allow vessels to move from one water elevation to another and are an integral part of the infrastructure. Finally, during winter, navigable lakes and rivers do freeze and must be cleared of ice to facilitate water transportation—enter the icebreakers.

The Role of the Federal Government

Even more than the other parts of the nation’s transportation system, marine transportation is a joint private and public sector enterprise. The private sector owns and operates the vessels and most of the terminals and is responsible for the commerce that flows through the system. The public sector provides much of the infrastructure to keep the system functioning in a safe, secure, and environmentally sound manner. While the responsibility of building, maintaining, and monitoring the interstate highway system rests mainly with federal and state departments of transportation, the responsibility for the MTS is carried out by many federal agencies.

For example, the National Oceanic and Atmospheric Administration surveys navigable waterways and issues charts depicting waterway depth as well as obstructions. The aforementioned locks and dams are mostly built and maintained by the U.S. Army Corps of Engineers, though the St. Lawrence Seaway Development Corporation has that responsibility on the St. Lawrence

Seaway. Finally, though there are some private “ice-breakers,” most of these services are provided by the U.S. and Canadian Coast Guards.

Other agencies such as the Federal Maritime Commission, the National Transportation Safety Board, and the Departments of Commerce and Justice also play a big part in the nation’s marine transportation system, as discussed in later articles in this edition. Some of the other agencies that play a big role in the MTS include:

- the Maritime Administration promotes and facilitates MTS use;
- the U.S. Department of Agriculture works to link U.S. agriculture to the world and so depends heavily on navigable waters to facilitate the movement of grain and other commodities;
- the Department of Interior (Bureau of Ocean Energy Management and Regulation Enforcement), which regulates offshore oil platform safety;
- the Military Sealift Command and U.S. Transportation Command deliver supplies, people, and equipment to support the U.S. Navy and the Department of Defense;
- U.S. Custom and Border Protection secures our homeland by preventing the illegal entry of people and goods while facilitating legitimate travel and trade;
- the Environmental Protection Agency regulates environmental standards.

Congressional Committees

Just as many federal agencies “own” parts of the nation’s marine transportation system, many congressional committees and subcommittees also have jurisdiction.

The House Transportation and Infrastructure Committee. As the name suggests, this committee has jurisdiction over all modes of transportation, including aviation, maritime and waterborne transportation, roads, bridges, mass transit, and railroads.

Its purview also includes other aspects of national infrastructure, such as clean water and waste management, the transport of resources by pipeline, flood damage reduction, the economic development of depressed rural and urban areas, disaster preparedness and response, activities of the U.S. Army Corps of Engineers, and various missions of the Coast Guard.

These areas of jurisdiction provide a comprehensive view of how communities across the United States are connected to one another, how infrastructure affects the growth and flow of commerce at home and abroad, and

how an effective government can improve the lives of its citizens.

Currently the largest committee in the House of Representatives, its six subcommittees are:

- Aviation
- Coast Guard and Maritime Transportation
- Economic Development, Public Buildings, and Emergency Management
- Highways and Transit
- Railroads, Pipelines, and Hazardous Materials
- Water Resources and Environment

The Senate Committee on Commerce, Science, and Transportation. This committee’s oversight is also very wide-ranging. In addition to the air, surface, and water transportation modes, it also exercises jurisdiction over competitiveness, exports, and consumer protection.

It is composed of seven subcommittees, as follows:

- Aviation Operations, Safety, and Security
- Communications, Technology, and the Internet
- Competitiveness, Innovation, and Export Promotion
- Consumer Protection, Product Safety, and Insurance
- Oceans, Atmosphere, Fisheries, and Coast Guard
- Science and Space
- Surface Transportation and Merchant Marine Infrastructure, Safety, and Security

Toward More Unified Efforts

Since federal responsibilities are dispersed over so many different agencies, it is easy for each federal agency to concentrate on its own statutory authorities and funding to accomplish its own mission. Not only is it easy, it is a statutory requirement.

If each agency is working within its own “silo,” however, this can lead to a situation where no one is minding the “national” interest. Opportunities for collaborating are lost—or, worse, agencies may be working at cross-purposes. There is also no central repository of system-level performance data that could be analyzed across agencies to determine a prioritized list of projects across the federal government.

To improve federal coordination, budget requests, and regulatory activities and policies that impact the MTS, President Bush in 2004 directed the creation of the Cabinet-level Committee on the Marine Transportation System (CMTS). The CMTS is chaired by the secretary of the Department of Transportation and works to coordinate federal efforts through a series of subordinate-level

continued on page 10

Matrix Comparison of Federal Agencies with Significant Responsibilities for MTS Functions

	Transportation-Related Functions	MTS Functions / Activities	Departments															
			DHS			Transportation			Commerce		Independent		Interior			Defense		
			USCG	TSA	CBP	MARAD	SLS	RITA	ITA	NOAA	EPA	NTSB	USFWS	USGS	BOEMRE	USACE	DOD	
INFRASTRUCTURE AND MOBILITY	Signage	Aids to Navigation	■															
	Infrastructure	Dredging, Locks / Dams					■			■	■					■		
		Ports-Terminals-Connectors				■					■					■		
		Bridges	■													■		
		Short Sea Shipping	■			■					■							
	International Competitiveness	Supply Chains and Efficient Freight Flow			■				■									
	Research and Technology	Ships, Shipyards, Equipment, Infrastructure	■		■	■	■	■		■	■						■	■
		Information and Management Systems	■	■	■	■	■	■		■	■						■	■
		MTS Data and Statistics	■			■	■	■									■	
	Leverage Private Investments	Title XI Program				■												
		Capital Construction Fund				■												
	Mass Transit	Ferry Systems	■			■		■										
	Traffic Management	Icebreaking	■															
		VTS	■															
		PORTS (Physical Oceanographic Real-Time Systems)								■								
		Vessel Traffic Separation Schemes	■															
		Pilotage on the Great Lakes	■															
		Rules of the Road	■															
		Abandoned / Sunken Vessels	■			■				■	■						■	■
SAFETY	Vehicle Inspection	Vessel Inspection	■															
		Offshore Platforms	■												■			
	Operational Restrictions	Vessel Restrictions	■													■		
		Waterway Restrictions	■		■											■		
	Investigation	Casualty	■								■							
	Equipment Approval	Lifesaving, Firefighting Equipment	■												■			
	Public Education / Awareness	Boating Safety	■							■								
	Vehicle, Traffic, and Environmental Information	International Ice Patrol	■															
		Weather								■								
		Tide and Current Data								■								
		Mariner Information	■			■				■				■			■	
		Charts	■							■				■				
		Vessel Documentation	■															
	Personnel	Crew Licensing	■															
	Assistance / Response	Search and Rescue	■							■								
Maritime Disaster		■	■	■	■				■	■	■	■			■	■	■	

Matrix Comparison of Federal Agencies with Significant Responsibilities for MTS Functions

	Transportation-Related Functions	MTS Functions/Activities	Departments														
			DHS			Transportation			Commerce		Independent		Interior			Defense	
			USCG	TSA	CBP	MARAD	SLS	RITA	ITA	NOAA	EPA	NTSB	USFWS	USGS	BOEMRE	USACE	DOD
SECURITY	National Defense Deployment	Ready Reserve Fleet	■		■	■											■
	Security of Mode	Port and Waterways	■	■	■	■											
		Facilities, Vessels	■	■	■	■											
		Containers	■		■												■
	Border Crossing	Migrant/Contraband Interdiction	■		■												
	Incident Response	Terrorism	■	■	■											■	■
ENVIRONMENT	Prevention	HAZMAT/Oil	■		■					■	■		■		■	■	
		Ballast Water	■			■					■						
		Dredge Material								■	■					■	
		Marine Debris	■							■	■						■
		Invasive Species	■			■				■	■		■			■	
		Air Emissions	■			■					■					■	
		Water Discharges	■								■						
		Ship Scrapping				■											
		River Gauges (Flood Warnings)	■							■						■	
		Wake (Ships, Fast Ferries, etc.)	■			■				■	■					■	
	Response	HAZMAT/Oil	■							■	■				■		
	Natural Resource Restoration	Beneficial Use of Dredge Mat								■	■		■			■	
	Living Marine Resources	Mammals, Fish, etc.	■							■			■				
	Sensitive Areas	Marine Protected Areas	■			■				■			■				
ENTERPRISE EXCELLENCE	Skilled Transportation Workforce	Maritime Workforce Development	■			■											
	Coordination and Outreach	Interagency Coordination	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Communication and Outreach	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

NOTE: This chart shows federal agencies with a significant role in the functioning of the Marine Transportation System and reflects the opinions of the author and not the Coast Guard. Further, while this list attempts to capture the most prominent MTS functions, it is not exhaustive.

Federal Funding

In September of 2002, the U.S. General Accounting Office conducted a study entitled "Federal Financing and a Framework for Infrastructure Investments," which gathered information on expenditures and collections from 15 federal agencies involved in supporting the commercial marine, aviation, and highway transportation systems for fiscal years 1999, 2000, and 2001.

Federal expenditures for the commercial marine transportation system averaged \$3.9 billion per year, while collections from the users of the system averaged only about \$1 billion annually. Since some of the collections from the system users were retained in MTS trust funds such as the Harbor Maintenance Trust Fund and the Inland Waterways Trust Fund, funding for about 80 percent of the \$3.9 billion spent on marine transportation came from the U.S. Treasury's general fund.

As noted in the report:

"During the same three-year period, federal expenditures for aviation and highway transportation systems averaged \$10 billion and \$25 billion, respectively, each year. Unlike the

The majority of federal funding for the MTS comes from the general treasury, unlike aviation or highway where the funding comes from their respective trust funds.

funding approach for the marine transportation system, which relies extensively on general tax revenue, the federal funding approach for aviation and highway relies almost exclusively on assessments on users ... During this period, federal agencies collected an average of \$11 billion each year from users of the aviation transportation system and an average of \$34 billion each year from users of the highway transportation system. As with the marine transportation system, most of these collections were credited to trust fund accounts."

The report also documented that customs duties levied on commodities imported through the marine, aviation, and highways systems averaged \$15.2 billion, \$3.7 billion, and \$928 million respectively.

Though the actual dollar values have changed over the last 10 years, the ratios of funds spent on each mode of

transportation as compared to one another have not. The take-away: The majority of the federal funding for the marine transportation system comes from the

general treasury, whereas the federal expenditures for the aviation and highways are well within the collections credited to their respective trust fund accounts.

Custom revenues generated through the maritime mode far exceed those generated through aviation or the highway system. However, custom revenues go to the general treasury and not to support the transportation mode.

Ironically, custom duties collected on imports through maritime traffic amounts to approximately \$15.2 billion, which is almost four times as much as that collected through aviation (\$3.7 billion) and 16 times as much as that of highway transport (\$0.9 billion), but unlike assessments on users of a transportation system, customs duties are taxed on imported goods without regard to their mode of transportation and deposited to the general treasury.

bodies such as the coordinating board and integrated action teams.

A cornerstone of the work accomplished under its auspices is the "National Strategy for the Marine Transportation System: A Framework for Action," published in July 2008. This seminal document sets forth the federal framework for addressing the nation's marine transportation system challenges 20 years into the future in the areas of capacity, safety and security, environmental protection, resiliency, and infrastructure financing.

However, this is just the first step. Much work still remains to be done to tap into the synergies generated from a coordinated federal government working together on this issue.

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About the author:

Mr. Rajiv Khandpur is chief of the U.S. Coast Guard Marine Transportation Systems Office. He is the principal coordinator for all Coast Guard policies related to marine transportation, waterways management, Great Lakes pilotage, polar and domestic ice operations, the National Ice Center, and the International Ice Patrol. Mr. Khandpur has more than 36 years of experience in the marine industry, having graduated from a maritime academy in India in 1974 and from the University of Michigan with a degree in naval architecture and marine engineering in 1982. He also received an unlimited motor chief engineer's license from the Department of Trade, United Kingdom, in 1980.

The U.S. Committee on the Marine Transportation System

*Enabling a federal agency partnership
in support of the U.S.
marine transportation system.*

by MS. HELEN A. BROHL
Director of the Executive Secretariat
U.S. Committee on the Marine Transportation System

In the 2011 State of the Union Address, President Obama noted that the federal government has many working parts and cited the ways in which federal fishery programs are divided among more than one agency. Similarly, federal marine transportation system (MTS) programs and responsibilities are spread among 11 departments, three independent agencies, and six White House offices.

For example, the U.S. Coast Guard and Customs and Border Protection are organized within the U.S. Department of Homeland Security. The Maritime Administration and Saint Lawrence Seaway Development Corporation fall under the U.S. Department of Transportation. The National Oceanic and Atmospheric Administration and U.S. Army Corps of Engineers are under the Department of Commerce and Department of Defense, respectively, while the Federal Maritime Commission is an independent agency.

Although this system may seem disjointed, the good news is that the effort to coordinate this widespread federal interest in the marine transportation system has been actively underway for more than a decade. Today, the U.S. Committee on the Marine Transportation System (CMTS) is an established partnership that provides a successful focal point to productively rally intera-

gency policy and activities to support the U.S. marine transportation system.

History of the “MTS Initiative”

The call for greater federal interagency MTS coordination and collaboration originated during the Clinton Administration. In the mid-1990s, there were various reports calling for improvements to the navigational safety of the nation’s MTS, including the National Research Council’s report “Charting a Course into the Digital Era” and the Transportation Research Board Marine Board’s paper “Minding the Helm.”

In 1996 the maritime industry association Intertanko called for federal agencies to improve the safety and environmental protection of U.S. ports and improve coordination among the nation’s various waterway management systems. The following year, then-U.S. Department of Transportation Secretary Rodney Slater sponsored a series of regional listening sessions at port cities across the country. At these sessions, stakeholders voiced concern for issues including the aging MTS infrastructure; inadequate channels; the need for a safe and environmentally sound, world-class waterway system; the need to improve cooperation among marine transportation system stakeholders; and the lack of an overall marine transportation system vision.

CMTS Organizational Structure

In the 2004 Ocean Action Plan the president directed the Committee on the Marine Transportation System to develop an inter-departmental partnership to:

- improve federal marine transportation system coordination and policies,
- develop outcome-based goals for the marine transportation system,
- integrate marine transportation with other modes and other ocean uses,
- recommend strategies and plans to maintain and improve the MTS.

In the years since its inception, the CMTS has blossomed into a dynamic federal interagency partnership with more than 25 agencies engaged in addressing timely and emerging marine transportation system issues.

Its organizational structure provides the opportunity for political, professional, and military leadership and staff to lend extraordinary expertise to the decision making process, merging system needs with the capabilities of the federal agencies.

There are essentially three layers of committee management and activities.

CMTS high-level policies are approved by the principals committee, led by U.S. Department of Transportation Secretary Ray LaHood.

Policy recommendations to the CMTS principals committee and joint activities are made by the coordinating board. The chair of the coordinating board rotates among four agencies: NOAA, USACE, MARAD, and USCG. In calendar year 2011, the chair is Margaret Spring, NOAA's Chief of Staff.

Assessments, activities, and reports are managed by integrated action teams (longer-term, multi-dimensional) and task teams (shorter, single-issue). The integrated action teams and task teams at the time of this writing are:

- U.S. Arctic Marine Shipping Integrated Action Team,
- Navigation Technology Coordination Integrated Action Team,
- MTS Research and Development Integrated Action Team,
- CMTS Ocean Policy Response Task Team,
- E-Navigation Strategic Planning Task Team,
- MTS Preparedness Task Team.

Additionally, a CMTS environmental stewardship discussion group meets quarterly for MTS-related agencies to share ongoing and proposed work on specific environmental topics.

CMTS

U.S. Committee on the Marine Transportation System

In 1998, Congress directed the Department of Transportation to establish an interagency task force to assess the adequacy of the nation's marine transportation system. The subsequent 1999 report to Congress by Secretary Slater, "An Assessment of the U.S. Marine Transportation System," provided a comprehensive assessment, including 150 recommended actions in seven strategic areas. It also advocated establishing an interagency committee to improve federal agency coordination, which did occur in 2000.

Positive partnerships evolved from the new Interagency Committee on the Marine Transportation System as it developed MTS policy papers. By 2004, the committee was swept up in the wave of a new ocean policy initiative that raised its visibility.

Today's Committee on the Marine Transportation System was developed from a recommendation by the U.S. Commission on Ocean Policy. The commission's final report of 2004, regarding commerce and transportation, entitled "An Ocean Blueprint for the 21st Century," recommended that the existing committee's stature be raised to cabinet level.

The administration concurred and recommended late that same year in the "Ocean Action Plan" that the new committee be chaired by the Secretary of Transportation, with broad inter-departmental participation. The federal response was swift; only six months later a charter for the new Committee on the Marine Transportation System was adopted.

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Recent Successes

One objective in the national strategy was to deliver timely, relevant, accurate navigation safety information to mariners. To accomplish this, the CMTS Navigation Technology Coordination team inventoried the many ways in which federal agencies provide navigation information to mariners. They determined that one issue in particular was key—the need for a common water level datum, a critical standard plane of reference from which sea and lake levels are recorded and monitored.

Charts

Additionally, providing mariners with up-to-date charts took longer and cost more since the National Oceanic and Atmospheric Administration (NOAA) had to recalculate depth soundings received from other agencies. High-level agreement by CMTS members led to collaboration between NOAA and the U.S. Army Corps of Engineers (USACE) to precisely mark channel limits and control channel depths.

As a result, USACE is building a digital framework of channels, collecting the precise positions of the maintained channels and controlling depths in the channel quarters, and NOAA is developing a process for rapid update of nautical charts with this new and more precise channel information.

Real-time Information

The committee also supports the mariner through distribution of the NOAA Physical Oceanographic Real Time System (PORTS)[®] via the USCG Automatic Identification System (AIS). PORTS[®] provides real-time water and atmospheric information that is pushed to the mariner via AIS. Initial tests in Tampa Bay, the locks at Sault Saint Marie, and the Columbia River have been successful, and the Coast Guard is now moving forward with plans to make this service operational in areas with vessel traffic services.

The AIS technology to provide other real-time information to the pilot house is also

being applied to the inland system called lock operator management applications (LOMA). The USACE is working with the USCG to use AIS to provide water information at locks, such as through the use of current meters, with data to be transmitted to users as the AIS sites are established. Providing channel information via the LOMA is critical to fend off towboat and tow allisions with the aging locks and dams on the inland and intracoastal system.

e-Navigation Strategy

With the increased use of electronic navigation, the committee has moved ahead to develop a national strategy by inventorying the suite of federal e-Navigation services to harmonize and prioritize federal activities. The strategy is intended to prescribe how the U.S. will implement e-Navigation concepts and activities in a cross-agency manner, coordinated with industry and other stakeholders.

The strategy will be consistent with and linked to international e-Navigation strategies and policies such as those of the International Maritime Organization and International Hydrographic Organization.

Looking Ahead

The CMTS Strategic Action Plan for Research and Development in the Marine Transportation System provides near- and long-term actions for the use of research and development to support MTS improvements. The Research and Development Integrated Action Team recently held a stakeholder workshop with the Transportation Research Board and intends to hold another in 2012 as a way to further address the needs of the system. In the 2010 U.S. Coast Guard Authorization Act, Congress directed the CMTS to coordinate domestic transportation policy in the U.S. Arctic. Fortunately, the committee had already jumped forward in this arena with the January 2010 approval of the CMTS U.S. Arctic Marine Transportation Integrated

Action Team (Arctic IAT) to provide the interagency forum for marine transportation policy in the U.S. Arctic. The Arctic IAT completed an initial inventory of federal marine transportation-related activities in the U.S. Arctic region. From this, the Arctic IAT developed a descriptive framework for a U.S. Arctic marine transportation system.

The integrated action team utilized the Arctic Marine Shipping Assessment and National Security Policy Directive 66 among other documents that call for improvements to various marine transportation services in the U.S. Arctic region. Potential areas to improve federal agency collaboration regarding the Arctic MTS include:

- Arctic waterways and traffic management,
- geodetic control and aids to navigation,
- improvements in federal Arctic marine infrastructure,
- marine weather and ice reports,
- federal transportation data sharing.

Additionally, the integrated action team will provide input to the Arctic objective in the White House Ocean Policy Task Force Report and, at the time of this writing, is developing an aggressive work plan for 2011.

The CMTS was also affirmed last year by the White House Ocean Policy Task Force Report, whereby it was acknowledged and directed to work with the newly formed National Ocean Council via the White House National Economic Council. In December 2010, the CMTS coordinating board approved formation of a CMTS Ocean Policy Task Team to respond to the nine objectives of the Ocean Policy. The Ocean Policy Task Team is working aggressively to complete a response by which the CMTS will work collaboratively.



The CMTS Today

Since 2004, the Committee on the Marine Transportation System has developed a body of foundational documents and projects to promote interagency coordination and support the needs of the U.S. marine transportation system. Its vision:

"The United States Marine Transportation System will be a safe, secure, and globally integrated network that, in harmony with the environment, ensures a free-flowing, seamless, and reliable movement of people and commerce along its waterways, sea lanes, and inter-modal connections."

The committee members recognized that the marine transportation system was at a crossroads, grappling simultaneously with increased globalization and international trade, new security requirements, and renewed focus on environmental stewardship. In its "National Strategy for the Marine Transportation System: A Framework for Action," the Committee on the

Marine Transportation System proposed recommendations under five priority areas:

- capacity,
- safety and security,
- environmental stewardship,
- resilience and reliability,
- finance and economics.

Despite no new resources, the committee began an aggressive implementation plan to carry out national strategy recommendations. CMTS interagency teams have established a dynamic group of activities and projects to improve the U.S. marine transportation system in the areas of:

- navigation technology coordination,
- MTS research and development prioritization,
- U.S. Arctic marine shipping policy,
- waterway preparedness,
- environmental stewardship interagency information exchange,
- national export initiatives.

The teams are also working to develop a response to the nine objectives in the White House Ocean Policy and to develop a national strategy for e-navigation.

About the author:

Ms. Helen A. Brohl is the director of the U.S. Committee on the Marine Transportation System, where she facilitated development of the first national strategy for the marine transportation system. She also serves as a U.S. commissioner for the World Association for Waterborne Transport Infrastructure and is a mentor with the Ohio State University John Glenn School of Public Affairs. Ms. Brohl received her B.S. from Florida Atlantic University and her M.S. from Ohio State University.

For more INFORMATION:

More information about the CMTS can be found at www.cmts.gov.

Keeping America's Commerce Flowing

Federal support of the marine transportation system.

by MR. JOE ZELASNEY
Policy Advisor

Committee on the Marine Transportation System

The Marine Transportation System

Waterborne carriage is one of the oldest forms of long-distance transportation. Today, America's marine transportation system (MTS) moves people and goods through U.S. ports, utilizing a system of harbor channels and waterways to final delivery points or connections to highways, railways, and pipelines.

The MTS is immense, consisting of thousands of miles of navigable channels and hundreds of port complexes and terminals as well as a wide range of specialized vessels, from river barges to gigantic oceangoing ships that ply our nation's waterways. The marine transportation system allows worldwide distribution of our nation's agricultural and manufactured products and carries 43.5 percent by value and 77.6 percent by weight of all U.S. international trade.¹

Though vessels are the most obvious elements of the MTS, the system is a large and diverse enterprise sustained by water and landside infrastructure, operational support services, and interconnections with other modes of transportation (or "intermodal" connections). A reliable and cost-effective supply chain ultimately impacts the productivity and competitiveness of U.S. producers and the prices paid by U.S. consumers. The performance of the marine transportation system influences where businesses locate, how they operate, and impacts demand for the goods and materials they produce.

FEDERAL ROLES IN MARINE TRANSPORTATION

The federal government's influence on the marine transportation system is multifaceted and far-reaching. Its departments and agencies play an integral role in supporting the MTS, facilitating commerce, and ensuring that the system functions in a safe, secure, and environmentally sound manner.

MARINE SAFETY

The U.S. Coast Guard (USCG) has overarching responsibility for ensuring that the navigation environment and operations are safe for vessel operators, crew, and passengers. The National Oceanic and Atmospheric Administration (NOAA) provides nautical charts and maps and water observation information used by mariners. Other agencies that contribute to the safety of the system include the U.S. Army Corps of Engineers (USACE), the National Transportation Safety Board, and the Maritime Administration (MARAD).

Aids to Navigation

The USCG places and maintains short- and long-range aids to navigation as part of its traffic management responsibilities to prevent vessel groundings and colli-



OCEAN AND COASTAL TRANSPORT GEOGRAPHY

The planet's oceans facilitate movement of goods and people, connecting markets around the world. Specialized vessels are utilized to move freight along our nation's coasts and around the world. Manufactured goods are generally shipped in standardized box containers; commodities such as mineral ores, petroleum, and agricultural goods are typically moved in bulk.

East Coast

For more than 300 years the numerous ports found among the East Coast's protected bays, inlets, and navigable rivers have been vital centers of international commerce. Important eastern ports include Boston, Norfolk, Savannah, Charleston, the Jacksonville Port Authority, and the Port Authority of New York and New Jersey—the nation's second-largest container port.

The Chesapeake and Delaware Canal is vital to ports on the Delaware River, Chesapeake Bay, and along the Northern Atlantic seaboard. It bisects Maryland and Delaware and connects the Delaware River with the north end of the Chesapeake Bay. The canal carries millions of tons of cargo annually, including 40 percent of all ship traffic in and out of the Port of Baltimore.

The Delaware River and Bay are home to the fifth-largest port complex in the U.S. in terms of total waterborne tonnage. Every year, more than 70 million tons of cargo move through the tri-state port complex, which includes the ports of Philadelphia, Pa.; Camden, Gloucester City, and Salem, N.J.; and Wilmington, Del. Ports in the region handle approximately 85 percent of the East Coast's oil imports.

Gulf Coast

Ports along the Gulf Coast are centrally located, with excellent water access to Europe, Africa, Latin America, and Asia via the Panama Canal. The Mississippi River grants access to a vast segment of the United States. Important Gulf Coast ports include Houston and Corpus Christi, Texas; New Orleans, La.; Mobile, Ala.; Gulfport, Miss.; and Tampa, Fla.

Petroleum products, agricultural products, and chemicals dominate the region's waterborne trade. The U.S. imports more than 60 percent of the oil it consumes, and roughly half of all oil imports enter the U.S. through a Gulf of Mexico port. Additionally, ports along the Gulf of Mexico provide critical support to the offshore oil industry and links to global markets for the heartland's highly productive agricultural community. Gulf ports also handle seven percent of U.S. containerized imports and exports.

West Coast

West Coast ports are the nation's principal gateways for trade with Alaska and Hawaii and Pacific Rim nations. Oceanborne transportation activities are concentrated in Puget Sound, via the Columbia River to ports in Washington and Oregon, in the San Francisco Bay and the Sacramento River in northern California, and in the San Pedro Bay in southern California.

Puget Sound is blessed with an abundance of natural deep-water harbors. Located within Puget Sound and along the Straits of Juan de Fuca are numerous ports of national significance, including the Ports of Seattle, Tacoma, Everett, and Olympia, Wash. Major

commodities shipped through the region include containerized manufactured goods, grain exports, and crude oil from Alaska. Puget Sound is also home to a majority of the Alaska fishing fleet.

Marine transportation in Northern California is centered on the San Francisco Bay—one of the world's greatest natural harbors. The bay's major ports include the Port of Oakland, Port of San Francisco, Port of Redwood City, and the Port of Richmond. The inland river ports of Stockton and West Sacramento help to round out Northern California's marine transportation portfolio.

Situated along the Gulf of Santa Catalina and the Santa Barbara Channel, Southern California's San Pedro Bay is home to the largest container port complex in the United States—Los Angeles and Long Beach. The ports handle approximately 40 percent of loaded U.S. container imports and 25 percent of loaded U.S. container exports each year.

Intracoastal Waterways

The Gulf Intracoastal Waterway, which runs for 1,300 miles from Texas to Florida, is used for moving grain, coal refinery products, and chemicals domestically and also for supplying feeder traffic to seaports. The Atlantic Intracoastal Waterway extends for 700 miles between Virginia and Florida, with controlling depths from seven to 12 feet.

Endnote:
Statistics from Cargo Business News, 2009.

sions. Today the Coast Guard maintains nearly 50,000 fixed and floating aids including buoys, day marks, fog signals, radio towers, and beacons.

Search and Rescue Services

Each year the U.S. Coast Guard responds to numerous calls for assistance from mariners in distress. Many of

the USCG's provisions and procedures for search and rescue conform to international agreements developed with Coast Guard participation through the International Maritime Organization, such as the International Convention for the Safety of Life at Sea.

Commercial Vessel and Crew Standards

The Coast Guard promulgates and enforces a variety of regulations governing vessel construction and equipment, seaworthiness, pilotage, fire protection, life-saving appliances, and crewmember qualifications. It exercises port state control of foreign-flag vessels operating in U.S. waters to ensure adherence to U.S. and international standards for vessel safety, security, and environmental protection.

MARAD contributes to the training of qualified mariners through support of the U.S. Merchant Marine Academy and by administering federal aid to state maritime academies. The academies train mariners to provide a sufficient merchant marine capability to serve U.S. commercial interests and the U.S. armed forces in the event of a military deployment.

Navigation Advisories and Nautical Information

Marine weather forecasts and advisories are provided by NOAA through the National Weather Service. On inland waterways the National Weather Service tracks river levels and icing conditions. NOAA is also respon-

sible for surveying and charting U.S. coastal waters and the Great Lakes (USACE surveys and charts the inland river systems).

Safety Monitoring and Assessment

In support of its safety mission and programs, the Coast Guard collects and analyzes information on marine incidents. The National Transportation Safety Board also has responsibility for monitoring marine safety performance. Though it conducts fewer marine investigations, it does focus on major events that result in significant loss of life, environmental damage, or casualties that involve another mode of transportation.

FACILITATING COMMERCE

The federal government and the U.S. Army Corps of Engineers in particular have a central role in building, maintaining, and operating the nation's navigation channels. The Saint Lawrence Development Corporation plays a more limited role in providing navigation infrastructure. Other agencies, including NOAA and the Coast Guard, provide essential navigation services.

OCEAN AND COASTAL TRANSPORTATION SYSTEM

Navigation Infrastructure and Services

Ships at sea rely on specialized service providers to get them safely to and from ports of call. In addition to shipboard operations, ships depend on a network of shore-side services and activities to prepare for their arrival, departure, and requirements while in port.

The vessel support industry includes companies that own and manage the vessels; ports and terminals where cargo is handled; yards for ship repair; services like marine insurance underwriters, ship chartering firms, admiralty lawyers, and engineering and research companies; and increasingly today, intermodal systems of trucks and railroads to distribute goods around the country.

U.S. coastal ports consist of thousands of miles of access channels leading to vessel berths. Congressionally authorized channel dimensions and dredging requirements

vary from place to place. Channels deeper than 12 feet are defined by the federal government as "deep draft," though many oceangoing vessels require depths in excess of 40 feet. Approximately 40 of the nation's deep-draft seaports have channel depths of 40 feet or more.

Shipping channels are marked by navigation aids that range from lighted buoys and beacons to radio navigation systems. Vessel operators use navigational aids in concert with nautical charts and current, tidal, and other water and weather information to safely transit U.S. coastal waters to and from seaports.

Seaports and Marine Terminals

There are approximately 70 deep-draft ports along the U.S. coast, which contain nearly 2,000 major terminals, including piers and berths used by vessels to dock and exchange freight and passengers. A seaport is often comprised of multiple marine terminals and other marine service fa-

cilities. Most large seaports are owned by public entities (state or local authorities), which lease individual terminals to private terminal and stevedoring companies.

Individual harbors, terminals, and ports differ in their physical attributes, organization, and patterns of use. Some ports specialize in specific cargo types such as grain and coal, while others handle a diverse mix of freight to include containers, bulk, and project cargoes. Some are connected directly to railroads or are situated in close proximity to interstate highways; others are connected to inland waterways or pipeline networks. Ideally, a terminal has efficient connectivity to rail, road, and/or pipeline networks.

Seaports compete regionally and even nationally for cargo, and their market share is determined by many factors including channel depth, landside capacity, local market size and manufacturing base, and connectivity to other regions.

The government also plays a critical role in regulating oceanborne transportation in the foreign commerce of the U.S. through the Federal Maritime Commission.

Navigable Channels

USACE is the chief federal agency responsible for ensuring that inland, coastal, and harbor channels sup-

INLAND RIVERS AND GREAT LAKES SYSTEM

Inland Waterways

The nation's major river systems are primarily shallow-draft waters with controlling channel depths that rarely exceed 12 feet. One notable exception is the lower 200 miles of the Mississippi, where depths are maintained to 45 feet. Navigable depths are maintained with the use of locks and dams, revetments and other channel training structures, and dredging.

Most of the commercial traffic moving on the navigable rivers is made up of pusher-style towboats that move barges laden with liquid and dry bulk commodities. Barges are loaded and unloaded at terminals situated along the river. There are more than 1,800 shallow-draft terminal facilities in the U.S., whose locations are determined by factors such as access to railheads, highways, and pipelines as well as proximity to commodity suppliers, processors, and users.

The largest and busiest inland waterway system in the U.S. is the Mississippi River system, which includes the Ohio and Missouri River tributary systems. It is the planet's number-two cargo-bearing river—behind China's Yangtze (1.2 billion tons) and ahead of Europe's Rhine (250 million tons)—moving approximately 500 million tons of cargo each year.

The Mississippi River and its tributaries boast more than 6,000 miles of navigable waterways which pass through 17 states before terminating in the Gulf of Mexico. It accounts for 86 percent of the length of the nation's inland river systems and 95 percent of total system tonnage. The U.S. is the world's largest exporter of agricultural products, and sixty percent of all grain exported from the U.S. is shipped via the Mis-

issippi River through the Ports of New Orleans and South Louisiana.

The Columbia-Snake River system extends for about 600 miles through the states of Idaho, Oregon, and Washington before terminating in the Pacific Ocean. Ports along the lower Columbia River, including Portland, Vancouver, and Longview move upwards of 30 million tons annually. The Columbia River is the nation's number-one export gateway for wheat and barley, and the U.S. West Coast's number-one dry bulk export gateway. Imported autos and containers arriving at Columbia River ports are delivered across 43 states.

The Black Warrior-Tombigbee River system runs for more than 400 miles through Alabama to the Gulf of Mexico. Various other U.S. rivers, such as the Hudson, Sacramento, and James Rivers, are used to move freight over short distances.

The Great Lakes and Saint Lawrence Seaway

Sometimes referred to as the "fourth sea coast," the Great Lakes and Saint Lawrence Seaway have features in common with both the inland and coastal waterways. The waterway stretches 2,342 miles from Anticosti Island in the Gulf of St. Lawrence to Duluth, Minn., at the western extreme of Lake Superior. This shortcut to the commercial, industrial, and agricultural heartland of North America is the world's longest inland deep-draft waterway.

Fifteen major international ports and more than 50 regional ports line the seaway and Great Lakes. They provide connections to nearly 30 rail lines and over 40 interstate and provincial highways, effectively linking

products, consumers, and industries all over North America. Some of the region's ports rank among the nation's largest in terms of tonnage, including Duluth-Superior, Mich.; Chicago, Ill.; Detroit, Mich.; and Cleveland, Ohio.

In addition to the five Great Lakes—Ontario, Erie, Huron, Michigan, and Superior—the waterway's transport relies on a series of rivers, canals, channels, and locks: the St. Lawrence Seaway and Welland Canal, the Detroit River–Lake St. Clair–St. Clair River section, and the Soo Locks Channel.

The Great Lakes and Saint Lawrence Seaway play an essential role in moving the raw materials that drive the nation's economy: iron ore and fluxstone for the steel industry, limestone and cement for the construction industry, and coal for electrical power generation. Other important cargoes include salt, sand, grain, fuel oil, petroleum products, chemicals, and forest products.

The Great Lakes are plied by bulk and tank carriers built specifically to operate on the lakes, and are typically too large to transit the Saint Lawrence Seaway to the Atlantic. Scores of smaller international vessels transit the seaway each year, moving between the Great Lakes and the Atlantic. Tug and barge units are also used extensively on the lakes. While navigation on much of the Great Lakes system is seasonal, lasting about nine months, icebreakers help ensure a reliable navigation season.

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port the nation's navigation needs. Altogether, it is responsible for the navigational infrastructure of approximately 12,000 miles of active commercial waterways. Its civil works branch is responsible for planning, building, maintaining, and operating lock sites on inland rivers; on the Atlantic, Gulf, and Pacific Coasts; and on the Great Lakes.

Additionally, USACE dredges river, lake, and inter-coastal waterways, and is responsible for keeping the inland rivers free of hazards, mapping and charting, and supplying and maintaining channel navigation markers and aids. In addition, it is responsible for the navigation channels and major infrastructure (such as breakwaters and jetties) in the nation's ocean harbors.

One notable exception is the locks along the Saint Lawrence Seaway, which are jointly operated and maintained by the Saint Lawrence Seaway Development Corporation (U.S.) and St. Lawrence Seaway Management Corporation (Canada).

The Coast Guard provides icebreaking services to keep the nation's channels and harbors open to navigation and permit a predictable navigation season on the Great Lakes, St. Lawrence Seaway, and rivers and harbors in the northeastern United States. The USCG also approves the location of and plans for bridges over navigable waters to ensure reasonable accommodations for marine users.

Vessel Traffic Management and Information

The Coast Guard is responsible for regulating vessel traffic on U.S. waters. This is accomplished by placing navigation aids and establishing "rules of the road" and vessel traffic management schemes in certain harbors and rivers with traffic congestion.

NOAA's National Ocean Service is responsible for mapping and charting more than 3,000,000 square miles of ocean floor, of which about 500,000 square miles have significant navigation activity.² NOAA also monitors currents, tides, winds, and other water and weather conditions and supplies the data to mariners.

MARINE ENVIRONMENTAL PROTECTION

Marine safety and environmental protection are, in many respects, inseparable goals. As such, the USCG has many responsibilities and functions aimed at environmental protection. It responds to pollution events and promulgates and enforces federal and international rules

intended to prevent marine pollution. The Environmental Protection Agency (EPA), Saint Lawrence Seaway Development Corporation, NOAA, U.S. Army Corps of Engineers, and MARAD also help to ensure maritime activities are compatible with the environment.

Marine Pollution Prevention and Response

The Coast Guard has authority to establish regulations governing the design, maintenance, and operation of vessels to ensure passenger and crew safety and protect the marine environment. It also establishes spill cleanup and liability regulations, investigates spill origins, and ensures that the responsible parties pay for cleanup and restoration.

NOAA provides technical information and scientific expertise for oil and chemical spill response, mitigation, and restoration. EPA provides monitoring to gauge the impact of spills on the marine environment.

Stewardship and Monitoring of the Marine Environment

The EPA is responsible for administering the National Environmental Policy Act, which is meant to ensure due consideration is given to the environment before federally supported projects are undertaken. It coordinates National Environmental Policy Act environmental impact assessments that other agencies such as USACE, USCG, and MARAD must complete for projects they undertake, approve, or help fund. The EPA also administers most of the country's major environmental statutes, including the Clean Water Act and Clean Air Act, both of which have implications to the operation of vessels and port complexes. It consults with the Coast Guard to establish vessel regulations.

The nation's coasts are managed by individual states with financial assistance from the federal government through NOAA's Coastal Zone Management program, which provides port authorities with technical guidance and information on protecting the coastal and ocean environment.

NOAA is also responsible for protecting marine fisheries through the National Marine Fisheries Service, which assesses impact to marine life and habitats as a result of placing structures in, dredging, and filling wetlands, as well as from disposing dredged material there.

PROMOTING NATIONAL SECURITY

The MTS plays a critical role in meeting the nation's military requirements and poses unique security chal-

allenges, including illegal immigration, drug smuggling, and the illegal transport of weapons. Since the terrorist attacks of September 11, a number of new programs aimed at enhancing port and maritime security have been enacted.

Port, Waterway, and Intermodal Security

The Coast Guard, as the only U.S. military service with law enforcement authority, has long assumed a role in securing the marine transportation system. Its responsibilities range from patrolling U.S. waters for vessels carrying drugs and undocumented migrants to preventing illegal and unreported fishing.

The Transportation Security Administration administers the Transportation Worker Identification Card program, which provides a common identification credential for all personnel requiring unescorted access to secure areas of regulated facilities and vessels and all mariners holding Coast Guard-issued credentials, as defined under the Marine Transportation Security Act.

Customs and Border Protection administers the “24-hour rule,” which requires ocean carriers and “non-vessel operating common carriers” to provide detailed descriptions of the contents of containers bound for the U.S. 24 hours before the container is loaded on a vessel in a foreign port. The rule allows U.S. customs officers to analyze the container content information and identify a potential terrorist threat before it arrives in a U.S. port.

The Port Security Grant Program is administered by the Federal Emergency Management Agency with input from the Coast Guard, MARAD, and Transportation Security Administration, and was created to support a sustainable, risk-based effort to protect critical port infrastructure from terrorism. The grant program funds are primarily intended to assist ports in enhancing maritime domain awareness; enhancing risk management capabilities to prevent, detect, respond to, and recover from attacks involving improvised explosive devices as well as chemical, biological, radiological, nuclear, explosive, and other non-conventional weapons; and

training and exercises and Transportation Worker Identification Credential implementation.

Military Support

A properly functioning marine transportation system also allows rapid deployment of military personnel, equipment, and supplies. MARAD, the U.S. Navy’s Military Sealift Command, and the U.S. Transportation Command have responsibilities related to military transportation and deployment capacity.

The Continuing Mission

Federal policies and programs concerning international trade, agricultural production, and many other areas affect the demand for and supply of marine transportation services, the structure of the maritime industry, and the efficiency with which it operates.

Additionally, the federal government, in part, finances, operates, and regulates the infrastructure and services that support the marine transportation system. It contributes to the construction and maintenance of federal navigation channels. In many waterways, it provides vessel traffic management systems, aids to navigation, certified nautical charts, and critical environmental information required by mariners.

The federal government also oversees vessel safety, sets environmental requirements, and responds to marine accidents that threaten public safety and the environment. It helps finance highways and other projects that connect marine ports and terminals to the national transportation system, and—now more than ever—it is seeking to ensure the security of the marine transportation system.

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—For more INFORMATION:

More information about
the CMTS can be found at
www.cmts.gov.

Congressional Support of the Marine Transportation System

Helping the MTS expand and adapt to its growing needs.

by MR. JOHN M. CULLATHER
former Staff Director, Coast Guard and
Maritime Transportation Subcommittee

Congress established the U.S. marine transportation system (MTS) in the very first Congress, and has supported it since with the enactment of laws to build lighthouses and establish lower duties on U.S.-flagged ships serving our domestic transportation needs. Over the years, Congress has regulated and promoted the MTS by enacting hundreds of laws to support the U.S. flag fleet, dredge harbors, build lighthouses, construct locks and dams, finance the construction of ships in U.S. shipyards, and conduct research and development on technological improvements to improve MTS efficiency.

The domestic waterborne transportation industry is commonly referred to as the “Jones Act” trade after the Merchant Marine Act of 1920 that contained the statutory framework for ships engaged in this trade. The Jones Act requires these ships to be U.S.-flagged, built in U.S. shipyards, and owned by U.S. citizens. A separate law requires these ships be manned by U.S. citizens.¹

There are thousands of ships supporting this trade, principally in the inland waterway system and the offshore supply vessel industry involved in the construction and support of the offshore oil and gas industry. Additionally, the domestic tug and barge fleet is comprised of more than 4,000 tugs and 28,000 barges that transport millions of tons of cargo annually. The U.S. flag fleet on the Great Lakes consists of 55 ships that move, on average, almost 163 million tons of cargo each

year, and the domestic offshore trades also have a significant number of vessels over 10,000 gross tons supporting those trades in the container and tanker markets.²

However, the coastal trades of the United States along the East, West, and Gulf Coasts have not seen a common use of self-propelled U.S.-flagged vessels to transport containers in decades. One company provided a container service on the West Coast for several years, but stopped that service to construct new ships for the Hawaiian trade. Several tug and barge companies have developed services to move containers between U.S. ports, but this has not evolved into a market for self-propelled ships.

Marine Highways

In 2007, Congress passed the Energy Independence and Security Act of 2007, which provided incentives to develop a “short sea” transportation system in the United States (also called the marine highways). The basis for this legislation was the belief that significant amounts of containerized cargoes or trucks could be moved by vessels on coastal routes, and that this would relieve congestion on surface roads and highways, resulting in a more efficient overall national transportation system.

The U.S. Maritime Administration has begun to implement this program by designating short sea transportation routes and providing grants to help start-up

ventures. However, supporters of the marine highway system have testified before Congress, saying that applying the harbor maintenance tax to short sea transportation cargoes has created a barrier to entry into this market. The tax was established to provide funding for dredging projects executed by the U.S. Army Corps of Engineers, and is assessed at a rate of 0.125 percent of shipment value.

This creates two problems for entities desiring to establish a short sea transportation venture:

- First, a shipper does not have to pay the harbor maintenance tax if the goods are shipped by truck or rail between two points in the United States.
- Second, the tax is collected by the U.S. Customs and Border Protection Service, which collects duties on goods imported into the United States. However, there are no easy mechanisms in place to collect a tax from a shipper whose cargoes are shipped domestically.

For these reasons, the domestic offshore trades were exempted from the application of the harbor maintenance tax in 1986. Legislation has been introduced in the House of Representatives and the Senate to exempt short sea transportation cargoes from the application of the tax. However, Congress has not acted on any of those bills.

The Congressional Budget Office has estimated that this exemption would result in the loss of less than \$10 million to the U.S. Treasury over 10 years. However, without that exemption, large-scale development of a short sea transportation system may be difficult.

In the Energy Independence and Security Act of 2007, Congress also established the Marine Transportation System National Advisory Council to:

- Identify impediments to the development of a short sea transportation system in the United States.
- Provide advice on ports and their intermodal connections to meet future national transportation system needs.
- Identify and develop strategies and policies to improve global competitiveness.
- Develop guidelines to foster the development of a national freight policy using our marine transportation system.

The Committee on the Maritime Transportation System

Established under a directive by President George Bush on December 17, 2004, the Committee on the Maritime Transportation System is a federal board chaired by the Secretary of Transportation, made up of federal agencies with responsibilities related to the MTS. Congress has since directed the committee to coordinate domestic transportation policies for the Arctic, including aids to navigation, marine safety, tug and salvage capabilities, oil spill prevention and response capability, and maritime domain awareness.

While Congress has clearly supported planning efforts to support the marine transportation system, funds to implement authorized programs have not been forthcoming and will probably not be provided, given the concerns about the growing federal deficit.

Marine Transportation System Challenges

Our marine transportation system must continue to expand and adapt to the growing needs of U.S. manufacturers, importers, exporters, and other shippers. Some of the challenges on the horizon include a widening of the Panama Canal in 2014, bringing with it the possibility that cargoes will flow differently to, from, and around the United States.

Greater amounts of agricultural commodities are transported in containers to keep unique strains of farm produce separated from the general commodity market. Our container market, designed to deliver goods to urban centers, will be challenged to get containers to rural locations at an economical price. Also, as container ships continue to grow in size, what is the obligation of the federal government to provide deeper channels for these ships?

Examining the challenges facing the marine transportation system requires an examination of the multiple components of that system, including:

- the coastal trade,
- the inland waterway system,
- the Great Lakes system,
- the domestic offshore trade to Hawaii, Alaska, and Puerto Rico,
- foreign trade.

The principal challenge facing the MTS over the next decade is the likely decrease in federal funding due to efforts to balance the federal budget.

Environmental issues such as air emissions from ships and port operations will also need to be addressed. However, this may significantly impact the marine transportation system if the industry is not provided adequate time to meet new environmental standards.

For example, Congress exempted steam vessels operating on the Great Lakes from new ship emission regulations because of concerns that the proposed Environmental Protection Agency regulations could create a safety hazard for those ships and force them out of service before low-emission engines or ships could be acquired. However, a similar exemption was not included for the steam vessels operating in the domestic offshore trades.³ Federal agencies must examine the impact on places such as Puerto Rico and Hawaii if steam vessels are forced out of the trade before replacement tonnage can be built.

A Look Ahead

Most Americans do not understand how their clothes, food, or other items are transported to their local marketplace. While they see trucks and trains operating in their town, the marine transportation system is largely invisible. Even communities with ports often view them as industrial centers, and may not fully appreciate their contributions to our national economy.

This failure to promote marine transportation's economic value, then, creates a challenge to developing support for initiatives to finance and safeguard the growing needs of the marine transportation system. So, in addition to focusing on capital improvements, supporters of the marine transportation system should focus on eliminating federal barriers that inhibit its growth.

Above all, a coherent growth strategy must be developed, tackling the unique issues facing the industry to meet the clearly growing demands on maritime transportation. The contribution of the marine transportation system to the national economy and the nation's economic vitality needs to be heralded, funded, and re-envisioned for an American MTS policy that sails, not sinks.

About the author:

Mr. Cullather served 34 years as a congressional staff member, and most recently served as the staff director for the Subcommittee on Coast Guard and Maritime Transportation. During his tenure on the transportation committee, he played a major role in drafting several Coast Guard authorization bills, the Maritime Transportation Security Act of 2002, and most recently, a bill to abolish ocean carrier antitrust immunity.

Endnotes:

¹ 46 U.S.C. 55101 et seq.; 46 U.S.C. 8103.

² <http://www.lcaships.com/CHARTF.HTM>

³ <http://www.epa.gov/nonroad/marine/ci/420f09068.pdf>



America's Seaports Promote Prosperity

A strong infrastructure supports a strong economy.

by MR. KURT NAGLE

President and CEO

American Association of Port Authorities

As primary gateways for overseas trade, U.S. seaports are critical links for access to the global marketplace and enable America's exports to compete internationally. Investment in America's port infrastructure and inter-modal connections—both land and waterside—helps the nation prosper and provides an opportunity to bolster the country's economic and employment recovery. A strong infrastructure helps American agricultural and mineral producers export their products, while U.S. manufacturing and assembly firms benefit from import transportation savings because they often rely on imported parts, components, and bulk commodities.

Seaports are so much more than safe harbors for ships to load and unload cargo. They

help us build and grow international trade, which strengthens the national economy. At the same time, seaports stoke local economic engines by providing high-paying jobs while supporting employment in other industry sectors—ranging from freight logistics to retailing—that rely on the efficient movement of



While partnerships are crucial for the success of America's seaports, the federal government's commitment has not adequately matched needs, often resulting in freight mobility congestion. Photo courtesy of the Port of Portland.

Economic Impact

Additionally, the benefits extend far beyond the communities in which seaports are located. On average, any given state uses the

In addition to handling international trade, U.S. seaports and the waterways that serve them are also important transportation modes for the movement of domestic ("short sea") freight. Greater utilization of America's coastal and inland water routes for freight transportation also complements other sur-

⁸ Bryant E. Gardner, "Short Sea Shipping Steams Ahead," *Benedict's Maritime Bulletin*, Second/Third Quarter 2009, pp. 112-115.

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AAPA Supports National Goals

In his 2010 State of the Union address, President Obama established a goal of doubling the volume of U.S. exports in five years. AAPA applauds this goal and is working to help it become a reality. Recent statistics show we're headed in the right direction; compared with the same period in 2009, U.S. waterborne exports in 2010 grew 23.9 percent in value and 15.5 percent in volume.¹

As Congress and the administration continue to develop policy and funding strategies to reach our national goals, AAPA has outlined several key federal programs and tax incentives related to ports that will create jobs, enhance sustainability, increase security, and provide long-term economic growth and prosperity for the nation.

Maintaining Waterside Access

The U.S. Army Corps of Engineers maintains the nation's water access to ports. The money to maintain these channels is collected from importers and domestic cargo shippers via the Federal Harbor Maintenance Tax.

Nevertheless, the federal government spends only about half of that tax collected for its intended purpose—deep-draft navigation maintenance.² Since its inception in 1986, a \$5.6 billion surplus has accumulated in the harbor maintenance trust fund while serious dredging needs have been neglected.³

AAPA has recommended that Congress take action to ensure 100 percent of the annual amount collected from the harbor maintenance tax is utilized to maintain federal navigation channels.

Bolstering Transportation Infrastructure

In addition to authorizing a new surface transportation bill in Congress

that creates a national freight program, several programs funded through the U.S. Department of Transportation can also improve port access, efficiency, and modernization. These programs would create jobs if additional funds are provided. They include:

- State highway projects for inter-modal connectors into ports that would mitigate traffic congestion. These include upgrades to roads, railways, tunnels, bridges, and new grade separations.
- The National Corridor Infrastructure Improvement Program and the Projects of National and Regional Significance, both of which address freight movement.
- The Transportation Investments Generating Economic Recovery program, or TIGER, which has

awarded \$1.5 billion and \$600 million, respectively, in two rounds of discretionary stimulus grants for freight and port infrastructure, and which AAPA urges that at least 25 percent of TIGER funding be used for port-related infrastructure.

- The Secure Efficient Ports Initiative, a new program to promote short sea (domestic) shipping, which can help alleviate road congestion and deliver more cargo via America's marine highways.

Enhancing the Environment

Although seaports devote millions of dollars annually to environmental enhancements in and around their facilities, additional investments at the federal level can help reduce emissions while creating jobs. For example, the Environmental Protection Agency's Diesel Emissions Reduction



Workers prepare to install a rail switch at the Port of Vancouver. Photo courtesy of Ms. Katie Odem, Port of Vancouver.

Act (DERA) grants program shows great promise. Ports that receive DERA funds can retrofit cargo-handling equipment; purchase lower-emissions trucks and equipment; retrofit ships, including dredges and tugs; and retrofit rail locomotive engines.

DERA grants have yielded immediate buying power, creating American jobs. AAPA was a key advocate in getting the program reauthorized for five years, and, going forward, will continue pressing for DERA grant appropriations at their full \$100 million/year authorization level.

AAPA is also working to ensure a strong federal ballast water management program is implemented nationwide. Doing so will reduce the risk of non-native invasive species entering our navigable waterways and provide a uniform system of protection that isn't undermined by a patchwork of competing state regulations.

Advancing Port Security

Programs that protect the people and cargo moving through our seaports help secure our homeland, keep goods moving, and stimulate jobs. AAPA recommends releasing the hundreds of millions of dollars in previously obligated Port Security Grant Program funds, reauthorizing the 2006 SAFE Port Act at the \$400 million/year grant level, and waiving the 25 percent cost-share requirement for ports to encourage new security measures and jobs and allow existing projects to be completed.

We also recommend that the Federal Emergency Management Agency, which manages the Port Security Grant Program, permanently allow the use of grants to help pay for port security personnel, which is the greatest ongoing security expense for most ports.



The Port of South Louisiana's security vessel takes part in a training exercise with the U.S. Coast Guard and state and local law enforcement agencies. Photo courtesy of the Port of South Louisiana.

Additionally, AAPA supports sufficient budget appropriations for its port security partners like the Coast Guard. Further, we believe enhanced coordination among the Coast Guard and Area Maritime Security Committees would be of mutual benefit.

AAPA also strongly supports the use of the U.S. Coast Guard's Maritime Security Risk Assessment Model (MSRAM) tool, which supports the Coast Guard's requirement to understand and mitigate the risk of terrorist attacks on port and waterway targets. We believe all jurisdictional agencies should work to compare security risk for targets throughout a port and encourage uniform use of MSRAM.

Tax and Trade Policy Recommendations
Several tax incentives could also enhance goods movement and bolster America's competitiveness. These include:

- Exempting certain U.S. port-to-port movements of maritime cargo from the Federal Harbor Maintenance Tax. Many in the maritime industry have recommended an exemption from the tax to promote domestic shipping, which would create maritime jobs, reduce road congestion and wear, and cut pollution. This change would remove a federal disincentive to using water transportation.

• Passing pending and new free trade agreements, including those with Panama, Colombia, and South Korea. Free trade agreements help U.S. businesses sell their products overseas, increasing exports, which creates jobs for farmers, manufacturers, freight transportation workers, and others. Timely ratification of these trade agreements should be part of congressional efforts to create jobs.

• Elimination of the alternative minimum tax on private activity bonds issued by public entities. Private activity bonds are necessary for infrastructure development projects, but the alternative minimum tax reduces the attractiveness of bond issues to investors.⁴ As a result, public port authorities must discount the bonds, reducing the funds available for investment in infrastructure as well as the jobs and income that would have been created.

Endnotes:

¹ U.S. Census Bureau, U.S. Merchandise Trade, Selected Highlights (Report FT 920); as published in AAPA Advisory, February 28, 2011.

² "Harbor Maintenance Trust Fund," Advocacy/Legislative Activity section of Associated General Contractors (AGC) of America website, 2011, p. 1.

³ Jeffrey A. McKee, Coastal Navigation Program Manager, U.S. Army Corps of Engineers, Washington, D.C., as of October 2010.

⁴ Government Finance Officers Association, Federal Liaison Center Issue Brief, "Non-Governmental Bonds," updated March 2010.



State and local officials must also take an active role in the maintenance and upkeep of the freight-handling systems in their jurisdiction. Freight traffic can become increasingly choked if policymakers put a higher priority on people-moving systems than on freight-moving infrastructure. This is most evident with connector roads around ports, which are often the “weak link” in the goods movement network.

Because roads and rails converge at ports—often at the same grade—it can cause congestion and delays as trucks wait for trains to clear intersections. Currently many roads, railways, and navigation channels are in disrepair or can’t handle the growing volume of freight traffic they are expected to accommodate.³

In short, while partnerships are essential to the success of America’s seaports, many crucial partnerships—particularly those with the federal government—need to be enhanced.

What Lies Ahead?

Now is the time to move forward to develop and implement policy and programs that will sustain and improve America’s critical gateways for global trade.

By raising the priority of seaports and their connecting infrastructure in various program and policy areas, America can achieve modern, navigable ports that are safe, secure, and environmentally sustainable while creating jobs for today and tomorrow.

About the author:

American Association of Port Authorities President/CEO Kurt Nagle has a master’s degree in economics and more than 30 years of experience in Washington, D.C. related to seaports and international trade. Prior to joining AAPA in 1985, he was director of International Trade for the National Coal Association and assistant secretary for the Coal Exporters Association.

Endnotes:

- ¹ John Frittelli, “Harbor Maintenance Trust Fund Expenditures,” Congressional Research Service, Jan. 25, 2010, p. 2.
- ² “National Strategy for the Marine Transportation System: A Framework for Action,” Executive Summary-Capacity, July 2008.
- ³ “Unlocking Freight,” American Association of State and Highway Transportation Officials (AASHTO), July 2010, p. 13.



The Port of Seattle, which is celebrating its centennial anniversary this year, will host AAPA’s 100th annual convention September 11-15, 2011. Photo courtesy Port of Seattle photographer Don Wilson.

Maritime Pathways of Commerce

Ocean shipping and the U.S. flag merchant marine.

by MR. STEPHEN M. CARMEL
*Senior Vice President
 Maersk Line, Limited*

Innovations in ocean shipping have helped to shape the trajectory of history. For example, harnessing the wind power of sailing vessels and later powering vessels via steam engines altered trade and even global power dynamics. "Containerization" has shaped the current age of globalization, which has seen immense advances in the global standard of living and a potential shift in the balance of power to the East.

Ocean shipping has also been intimately associated with the security and defense of the U.S. since the country's founding, and remains a dominant mechanism by which America is connected to the rest of the world.

The U.S. as a Trading Nation

The U.S. is one of the world's leading trading nations, and trade makes up a significant portion of our total economic output. For example, the Business Roundtable estimates that more than 30 million American jobs are attached to trade, amounting to approximately 18.2 percent of total employment.

While the U.S. is one of the world's largest exporters (behind Germany and China), our domestic market is so large that only a small portion of U.S. businesses view exports as a viable market. That percentage is likely to grow, however, under the current administration's national export initiative, which seeks to greatly increase this country's exports.

Alternatively, the U.S. is dependent on trade for an array of goods that are not available domestically. For example, even though the U.S. is a major producer of crude oil, it is by far the largest consumer and importer. America produces roughly 8.3 million barrels of crude per day, but consumes about 20.6 million. Canada sup-



Ocean shipping is a major means by which the U.S. interfaces with the world. All photos courtesy of Maersk Line, Limited.

plies about 2.5 million barrels per day via pipeline, leaving just under 10 million barrels per day that we need to import by ship.¹



There are no U.S.-flag oil tankers in the foreign commerce of the U.S.

as U.S. production of natural gas ramps up through development of shale gas, it is entirely possible the U.S. will become a major exporter of liquefied natural gas (LNG).

But even though 72 percent of U.S. trade is in bulk commodities, perhaps the most visible reminder to the average citizen of the role maritime commerce plays in daily life is the container.⁴ Roughly 30,000 containers enter the U.S. by water every day, 365 days per year. China is the source of 48 percent of them. China (including Hong Kong) is also the single largest destination of U.S. containerized exports.⁵

Though it's probably not news to anyone that we need to import significant quantities of oil, it probably will surprise many that we are also not remotely self-sufficient in uranium for our nuclear power. The U.S. imports roughly 86 percent of the 50 million pounds of uranium we consume in commercial power plants in a year.²

Trade is ubiquitous in our daily life, and global shipping trade is the reason we have fresh fruit in winter, flat panel displays, inexpensive computers, pharmaceuticals, and a host of other products. There can be ingredients imported from about 15 different countries in a loaf of whole grain bread and shirts sold in our department stores carry labels reading "Made in Honduras," with a separate label that says "Made from 100% Pakistani cotton."³

Trade, in short, is indispensable to our way of life and economic well-being.

Ocean Shipping in Global Trade

A significant amount of global trade moves by water. Some would argue that approximately 90 percent of international trade travels via waterways. That's close, but I contend that about 80 percent of global trade in physical "stuff" as measured by volume moves by water. Regardless, there is no argument that ocean shipping is a critical component of our overall economic security.

The U.S. is a world leader in the export of agricultural products that move primarily by bulk (although containerized bulk agriculture products are becoming more common). Our oil imports move by tanker, and

Containerization and parallel developments in information technology have led directly to the globalization we see today. Disaggregation of supply chains, trade in intermediate goods, and leveraging of comparative advantage at ever more granular levels has afforded the average consumer a range of goods almost unimaginable not long ago, at prices that are lower than could otherwise be the case, making those goods accessible to more people.

Further, to the extent that our national defense is built on a strong, vibrant economy and our economy is in a large way dependent on trade, our national security is indirectly dependent on ocean shipping. Our national defense is directly dependent on ocean shipping since various weapons systems are crafted from imported materials or components. Additionally, ocean shipping is a major means by which the U.S. military deploys its equipment and supplies around the world.

The Role of a U.S. Fleet

There can be little doubt that balanced and vigorous trade is indispensable to our economic security. The role of ocean shipping in our foreign commerce is also without question. What is in question: the role of the U.S.-flag merchant marine in our foreign commerce.

At the moment that role is insignificant. While much visibility is given to our dependence on foreign oil, it's not well known that we depend 100 percent on foreign tankers to deliver it. There are no U.S.-flag crude tankers in international trade, and there have not been for years.

Likewise, agricultural exports—a crucial component of our overall exports—also all go via foreign-flag bulkers. While there are a few U.S.-flag bulkers, they are engaged in food aid, an extension of U.S. foreign policy. Overall, U.S.-flag ships carry less than two percent of the foreign commerce of the U.S.⁶ The question we need to ask: Does that matter?

There are currently just fewer than 100 U.S.-flag ships in non-domestic service.⁷ Sixty of these are in the maritime security program, which provides an operating stipend to partially offset the higher cost of operating under the U.S. flag in exchange for making the ship available to the military in times of need. That stipend is not enough to fully offset the higher costs, so access to U.S. government cargo preference volume—a separate government funding stream—is also required. In short, these ships exist to serve the U.S. military, not U.S. commerce.

The balance of U.S.-flag ships in non-domestic service also are dependent on U.S. cargo preference programs such as food aid, the military, or Export-Import Bank-financed cargo. As such, these ships are also not genuinely in the foreign commerce of the U.S.; they are extensions of government programs, and therefore dependent on U.S. government money.

These programs have been unsuccessful in sustaining a commercially viable U.S.-flag merchant marine, as the only ships in foreign service depend on government money to survive. In addition, these programs have led to a U.S. merchant marine fleet that is increasingly behind the international community in technology. The median age of the U.S. Jones Act⁸ fleet is 27.5 years; the median age of U.S.-flag ships in foreign trade is 14 years. In comparison, the median age of Maersk ships in the international fleet is six years.

Additionally, U.S. mariners are working with technology that is at least a generation behind that of their foreign counterparts, and for the Jones Act folks, several generations, casting doubt on claims that the U.S. flag fleet is either modern or efficient.⁹ The real tragedy: Our cadets from the maritime schools are typically training on outdated ships, which means that they graduate with a disadvantage as compared to graduates of international maritime programs.



What is the future of the U.S.-flag merchant marine?

U.S.-Flag Merchant Marine—Worth the Effort?

The U.S. has no overarching maritime strategy that focuses specifically on the U.S. merchant marine or the role of waterborne shipping within an integrated multi-modal international supply chain.

A fundamental question that the country must ask is whether a U.S.-flag merchant marine is worth the effort to have. At the moment, the answer, based on what we see and how we act, is “no.”

While strategies like the maritime security program and cargo preference will act as life support, they will not address the long-term structural issues that are afflicting the U.S.-flag merchant marine. They will be successful at staving off death for as long as Congress funds them, but they will not provide the necessary

environment for a vibrant industry with the capacity to grow along with our economy and trade.

The structural issues that must be dealt with are much deeper than simply stating the U.S. flag is too expensive. There are fundamental reasons for this that businesses cannot correct and that require a serious policy analysis strategy to address, and legislative action to implement. Remember, many of the operators of U.S.-flag, foreign-going ships also have large and profitable globally competitive foreign-flag fleets. It is my contention, therefore, that American shipping companies understand how to operate in the international arena, and would be quite capable of running commercially viable U.S.-flag fleets independent of government support if the underlying environment was correct.

much more needs to be done. If the answer is “no,” then current policy is too much and certainly a redirection of resources needs to be investigated.

Either way, the status quo is unacceptable over the long term.

About the author:

Mr. Steve Carmel is senior vice president of Maritime Services at Maersk Line, Limited. He is a former ship's master and is currently a Ph.D. candidate in international political economy at Old Dominion University. His research and publishing interests include maritime security, trade, and Arctic regional issues.

Endnotes:

- ¹ Derived from statistics at U.S. Energy Information Agency Web site: <http://www.eia.doe.gov/>.
- ² Ibid.
- ³ “A Multinational Loaf,” New York Times, June 15, 2007.



Container ships are the workhorses of globalization.

Dependence on a continuous flow of government money is dangerous. Dependence on multiple sources of government money, the failure of any one of which is debilitating, is even more dangerous at any time, but never more so than now. The U.S.-flag merchant marine is just one appropriation cycle away from oblivion.

The question at hand: Does this country need a viable U.S.-flag merchant fleet for its economic security? If the answer is “yes,” then current policy is inadequate and

- ⁴ “Assessment of the Marine Transportation System (MTS) Challenges,” Volpe National Transportation Systems Center, USDOT, Dec. 2009.
- ⁵ Calculated from U.S. Maritime Administration data at http://www.marad.dot.gov/library_landing_page/data_and_statistics/Data_and_Statistics.htm.
- ⁶ American Shipper online 7/21/2010 reporting on Testimony by the Maritime Administrator to the House Subcommittee on the Coast Guard and Maritime Transportation, <http://www.americanshipper.com/NewWeb/SNews/shippers-newswire/transport-ocean/163805-congressman-calls-for-bigger-us-fleet.html>.
- ⁷ U.S. Maritime Administration, U.S. Water Statistical Snapshot, http://www.marad.dot.gov/documents/US_Water_Transportation_Statistical_snapshot.pdf.
- ⁸ Maersk Line Limited calculations based on fleet data from the U.S. Maritime Administration and internal Maersk data.
- ⁹ Ibid.

The Federal Maritime Commission

*Celebrating 50 years of
developing efficient intermodal
practice development and leadership.*

by MR. RICHARD A. LIDINSKY, JR.
Federal Maritime Commission Chairman

The Federal Maritime Commission, or FMC, is an independent regulatory agency responsible for regulating oceanborne transportation in U.S. foreign commerce for the benefit of exporters, importers, and the American consumer.

Its mission is to foster a fair, efficient, and reliable international ocean transportation system while protecting the public from inequitable and deceptive practices. The commission regulates ocean carriers, ocean transportation intermediaries (non-vessel operating common carriers and freight forwarders), marine terminal operators, and cruise lines. It also responds to actions by foreign governments or foreign carriers that create unfavorable conditions for the U.S. foreign trade.

Current commissioners:¹

- Mr. Richard A. Lidinsky, Jr. (chairman),
- Mr. Joseph E. Brennan,
- Ms. Rebecca F. Dye,
- Mr. Michael A. Khouri.

The principal statutes or statutory provisions the commission administers are:

- the Shipping Act of 1984,
- the Foreign Shipping Practices Act of 1988,
- section 19 of the Merchant Marine Act, 1920,
- Public Law 89-777.

Most of these statutes were amended by the Ocean Shipping Reform Act of 1998.

2010 HIGHLIGHTS

Last year was an active one for the Federal Maritime Commission. Highlights follow.

Supporting U.S. Exports Economic Recovery

Following what shippers would categorize as the worst year in the maritime industry since the invention of the container ship, the year 2010 began with a recovery in ocean trade that was stronger than many anticipated. Demand for cargo space and containers outstripped supply, and American shippers saw supply chain disruptions such as abruptly cancelled bookings, cargo rolled to the next sailing, and successive surcharges and price increases.

The FMC was established as an independent regulatory agency in 1961 and charged with administering regulatory provisions of shipping laws. It consists of five commissioners who are appointed by the president (one of whom the president designates as chairman), and all are confirmed by the U.S. Senate. No more than three commissioners may belong to the same political party.

The FMC conducted an aggressive search for solutions to supply chain problems that could stand in the way of increased exports and the continued recovery. In March, the commission began an investigation into vessel capacity and container availability issues led by Commissioner Rebecca F. Dye. The fact-finding team held more than 170 interviews with a variety of companies and organizations involved in international ocean shipping, led a series of best-practices discussions among shippers and carriers, and began Internet-based collaborative efforts to develop solutions to container availability issues.

Commissioner Dye's team issued an interim report and recommendations in June 2010 and a final report and recommendations in December. Ongoing efforts to implement these recommendations include:

- **Rapid Response Teams:** In June 2010, the commission established "rapid response" teams to provide prompt solutions for commercial disputes between carriers and their customers.
- **Increased TSA and WTSOA Oversight:** In September, the FMC ordered that members of the rate discussion agreements in the United States' largest trade-lane, the Transpacific Stabilization Agreement (TSA) and Westbound Transpacific Stabilization Agreement (WTSOA), file verbatim transcripts of their meeting to provide the commission with critical information relating to whether member carriers are improperly discussing capacity.
- **Increased Carrier Alliance Oversight:** The FMC increased oversight of global vessel alliances, which have authority to set capacity collectively.
- **International Ocean Transportation Working Group:** In December, the commission voted to form two working groups. The first is an international ocean transportation working group which will focus on:
 - booking cancellations and rolling cargo;
 - improving shipper forecasting and minimum quantity estimates;
 - export capacity forecasting;
 - other ways to improve the shipper-carrier relationship, including collaboration on major supply chain changes.
- **Intermodal Container Availability Working Group:** The second group will focus on issues with container availability for U.S. exporters.
- **Service Contract Enhancement Project:** The commission also voted in December to move forward with a project focused on helping small U.S. exporters and importers improve their service contracting practices through education and outreach. The project will include a Web-based educational tool.

Protecting American Consumers

In 2010, the commission was also active in its mission to protect American consumers who ship their personal goods overseas or take cruises.

Each year, the FMC receives a substantial number of complaints from individuals who have experienced problems with their international household goods shipments. In June, FMC Commissioner Michael A. Khouri began a fact-finding investigation into these issues. In December, the commission approved several interim recommendations including:

- **Consumer Education:** The commission voted to upgrade its Web site to better assist customers shopping for international shipping options, engage in formal cooperation with other governmental agencies who protect consumers moving household goods, enhance cooperation with trade associations representing household goods movers, develop information for ocean transportation intermediaries to distribute to consumers moving household goods, target outreach to local communities that regularly ship household goods overseas, and encourage household goods movers to link their Web sites to the FMC's for consumer information.
- **Industry Best Practices and Model Forms:** The Federal Maritime Commission also voted to work with industry groups and consumers to develop a set of best practices and model shipping forms that address issues consumers have encountered when shipping household goods.
- **Licensing Issues:** As the commission works to update its licensing regulations, it will include recommendations for adjustments that specifically address issues with household goods shipments.
- **Enforcement:** The FMC voted to enhance joint law enforcement efforts to protect consumers, address problem household goods movers, and develop enforcement strategies that focus on entities offering services related to household goods shipments.

- **Alternative Dispute Resolution:** The commission also decided to move forward with initiatives to better promote alternative dispute resolution services to assist consumers who experience problems when moving their household goods overseas.

Commissioner Khouri's fact-finding team is currently working on the second phase of the investigation, and will submit a final report and additional recommendations.

In addition, the commission has been conducting a notice of inquiry to update its financial protections for cruise passengers. The FMC conducted a hearing on the issue and is currently developing a proposal to update its rules for passenger protection.

Encouraging an Efficient, Sustainable Ocean Transportation System

In January 2010, the Federal Maritime Commission allowed the Transpacific Stabilization Agreements member lines to work together to implement slow steaming and other environmental initiatives. Slow steaming, or operating at reduced speeds, allows vessels to save fuel, which reduces their emissions and affords substantial cost savings.

Transpacific Stabilization Agreement member lines have indicated that they may also use their new authority to work to increase use of alternative fuels, cold ironing (shore power electrification), and other pollution-reducing technologies. While these practices hold promise for reducing vessel emissions, the FMC will closely monitor slow-steaming arrangements to ensure they do not cause unreasonable constraints now that international shipping demand has recovered.

Preventing Fraud and Enhancing Safety and Security

The FMC's Bureau of Enforcement and area representatives continued efforts to prevent unfair and deceptive practices. The targeted violations included misdescription of cargo, which poses serious safety and security risks.

Monitoring Foreign Practices to Protect American Jobs

The commission was also vigorous in carrying out its charge to monitor and prevent practices by foreign governments or entities that adversely affect American

commerce. Following concerns raised by U.S. shippers, Chairman Lidinsky and the FMC's General Counsel Rebecca Fenneman visited the Shanghai Shipping Exchange to obtain assurances regarding protections for confidential information of U.S. companies that must be filed with the exchange.

The FMC's general counsel also raised these issues and concerns of U.S. non-vessel operating common carriers in October as part of the U.S. delegation to bilateral consultations with the Chinese Ministry of Transport under the U.S.-China Maritime Agreement. The commission will continue to follow these and related developments in China closely to ensure that no unreasonable conditions exist that would impair U.S. commerce.

The commission is also studying effects in U.S. trades of the European Union's repeal of its block exemption for liner conferences. In November 2010, the FMC requested input from all interested parties, and is planning to complete its study in the fall of 2011.

A Look Ahead

In celebration of its 50th "birthday," the Federal Maritime Commission will hold a series of events focusing on trends in the maritime industry and highlighting the commission's history as a leader in developing the efficient intermodal practices that revolutionized global trade.

As the year progresses the FMC will also be busy making new history on the critical issues of shipping capacity; container availability; supporting increased exports; protecting consumers; encouraging efficient, sustainable ocean transportation practices; enhancing safety and security; reducing regulatory burdens; and keeping a close watch for foreign maritime policies and practices that could harm U.S. commerce.

About the author:

Mr. Lidinsky was designated Federal Maritime Commission chairman in 2009. He came to the commission as a 37-year veteran in the maritime trade industry from positions held in both business and government. He received his BA from the School of Government and Public Administration of American University, and in 1972 his JD from the University of Maryland. He also served in the U.S. Coast Guard on active and reserve duty.

Endnote:

¹ One commissioner was not yet confirmed by the Senate at the time this article was written.



Our Marine Transportation System: The Competitiveness Context

by MR. DAVID LONG
*Director, Office of Service Industries
 Manufacturing and Services
 International Trade Administration
 U.S. Department of Commerce*

Several years ago, a little-noticed public service advertisement appeared on Washington, D.C. buses. Paraphrased, it stated: “The product you’re using today was on a vessel yesterday.” While relatively few people who saw this advertisement recognized its significance and context, America’s manufacturers and shippers—indeed, all who import and export—understand this.

America’s marine transportation system is the primary link in the international trade chain that connects our producers (and American jobs) to the global economy. Improving the flow of U.S. goods into global markets is crucial to improving American competitiveness in world trade, and to the success of President Obama’s National Export Initiative (also known as the NEI), which seeks to double America’s exports by the end of 2014 to support millions of jobs here at home.

Any maritime element failure or chokepoint can delay the movement of these goods, resulting in higher costs, lost sales, and missed export targets. However, our maritime sector’s problems are just one aspect of the much larger competitiveness issues that face America’s entire freight system and its infrastructure.

To address these issues, and to further President Obama’s goals, the Departments of Commerce and Transportation are working together in the Competitive Supply Chain Initiative. This is a comprehensive, user-focused effort to improve the efficiency and connectivity of the entire U.S. freight and supply chain infrastructure. The goal: to support domestic economic growth and boost U.S. exporters’ ability to sell their goods in the global marketplace.

Our Marine Infrastructure in Context

Marine transportation is crucial to American trade. For most goods in U.S. merchandise trade, a U.S. seaport is the portal through which they leave or enter our economy. Nearly 50 percent of U.S. international merchandise trade by value—and nearly 80 percent by volume—enters or leaves the United States as oceanborne trade. U.S. merchandise trade exports are particularly reliant on marine transportation, which carries 76 percent of U.S. merchandise export tonnage and 36 percent (the leading share) of U.S. exports by value. In fact, in terms of tonnage, ocean transport carries more U.S. international merchandise trade than air cargo, trucks, railroads, and pipelines combined.¹

Our maritime infrastructure is straining to keep pace with the long-term growth of U.S. trade. Channel and berth dredging at key seaports, expanded maintenance dredging in our harbors and waterways, port expansion, and improvements to port operations are all needed to support the international competitiveness of our oceanborne exports.

However, our marine system stresses are only part of a much bigger problem. U.S. shippers and seaport managers alike report that the biggest impediments to trade flow are found not in our ports, but in the inland and landside links through which goods are transported to and from U.S. seaports and within the United States.

Challenges for Shippers

Leading business and port and transport officials have described systemic long-term deficiencies throughout

America's entire domestic transportation infrastructure, including:

- lack of sufficient last-mile road and rail port connections;
- overloaded and deteriorating roads and highways;
- insufficient rail system and intermodal interchanges;
- a general lack of communication and coordination between and among shippers, carriers, and regulators.

America's shippers say these problems have a dramatic impact on the speed and predictability of goods movement throughout the United States. A top manufacturing executive recently told Department of Commerce and Transportation officials that when all of our domestic transport and logistics system inefficiencies are taken into account, a finished good moves between Midwest locations and East Coast ports at a top speed of 12 miles per hour. Recently, one senior transport executive asked whether our policy makers really think we can substantively expand our manufacturing base with our existing supply chain infrastructure.

Due to domestic transport system inefficiencies, an export product moves from the Midwest to East Coast ports at a top speed of 12 mph.

Shippers blame these systemic problems on our failure to implement a comprehensive system-wide U.S. freight infrastructure development strategy and on our mode-specific approach to transportation planning and investment. The result, they say, is that America is not improving our freight infrastructure fast enough to keep pace with the export demands of 21st-century supply chains.

This issue is critical to American economic recovery and sustained growth. In a world in which entire supply chains compete with one another, supply chain competitiveness affects the cost of every single product made, moved, bought, or sold in the United States, and whether we can meet global prices. It also determines where companies invest and hire.

In contrast to the United States, our top trading partners—including Canada, Asian nations, and European Union countries—are developing comprehensive cross-modal freight and infrastructure policies that facilitate the movement of their goods to meet their national export and growth goals in a global economy. To avoid falling behind these nations, and to meet the president's goals, the United States must move quickly.

The National Export Initiative

The Competitive Supply Chain Initiative is an element of President Obama's National Export Initiative. Announced in January 2010 as part of the State of the Union address, the NEI is a long-term growth effort intended to double America's exports by the end of 2014 and support millions of American jobs. It marks the first time the U.S. government has deployed a cabinet-wide export promotion strategy, with focused attention from the president.

The NEI includes five strategic components:

- an administration-wide effort to improve federal trade advocacy and trade promotion on behalf of U.S. exporters;
- increased access to export financing, especially for small and mid-size businesses;
- action to remove overseas trade barriers that block the sale of U.S. goods and services, to open as many new markets as possible;
- robust enforcement of trade agreements and rules;
- promotion of domestic and global policies that lead to strong, sustainable, and balanced economic growth.

The Export Promotion Cabinet's September 2010 NEI report to the president makes it clear that intensified collaboration among federal agencies to improve America's overall supply chain and transportation infrastructure (including its marine system) is crucial to our efforts to help U.S. exporters expand their sales to overseas markets. As the report states:

"Improvements in the U.S. transportation and supply chain infrastructure are critical to enabling exporters from all 50 states to get their goods to ports quickly and inexpensively. Maintaining a globally competitive, user-focused U.S. supply chain infrastructure is critical to the success of the NEI and to sustained American economic growth ... Canada, the European Union, and

continued on page 39



Recent NEI Successes

Memorandum of Understanding

In April 2010, Secretary of Commerce Gary Locke and Secretary of Transportation Ray LaHood signed a memorandum of understanding on national economic and supply chain competitiveness and sustainability under which the Departments of Commerce and Transportation will work to advance U.S. competitiveness by developing a comprehensive national freight policy.

Anticipated activities include coordination in freight policy development, studies to identify freight transportation capacity and constraints, and identifying appropriate freight movement and supply chain performance measures.

Supply Chain Competitiveness Advisory Committee

Work is under way to establish a federal supply chain competitiveness advisory committee made up of representatives from America's trade-

dependent and shipping industries and from each mode of freight transportation. The committee will provide policy makers with continual high-level advice from industry advisers on how to develop comprehensive national supply chain and freight policies that improve our export competitiveness.

Congressional Interest

In April 2010, Assistant Secretary of Commerce Nicole Lamb-Hale and Assistant Secretary of Transportation Polly Trottenberg testified before the Senate Finance Committee, noting the need for a comprehensive, competitiveness-oriented national freight policy to increase America's exports, jobs, and economic growth. Members of Congress have expressed support for the types of policies that both departments are pursuing under this joint initiative.

Additional opportunities to testify on this issue are anticipated as the

new Congress begins work on surface transportation policy reauthorization issues.

Regional Outreach

The departments are engaged in a comprehensive series of joint outreach forums to regional freight stakeholders to improve our understanding of America's local supply chain and transportation problems. At these forums, the departments are gathering in-depth data on each region's top national and local supply chain and freight infrastructure issues and what regional stakeholders view as potential solutions.

Since September 2010, forums have been held in Atlanta, Chicago, San Diego, Kansas City, and Seattle, with crucial lessons learned at all five events. Additional forums are planned in 2011.



Can we substantively expand our manufacturing base with our existing supply chain infrastructure?

other competitors have already adopted similar policies that promote their supply chains and national development. Many of the United States' most important exporters are farmers located in rural areas and manufacturers that have built plants in rural areas to keep production costs low. The federal government needs to make sure that these exporters, like their counterparts in the urban markets, are connected to export ports through a systematic and smoothly functioning network of airports, railroads, roads, and waterways."²

Competitive Supply Chain Initiative

Through the Competitive Supply Chain Initiative, the Departments of Commerce and Transportation and our interagency partners are seeking to meet the president's export goals while responding to industry concerns over the state of America's supply chain infrastructure. The ultimate objective is to achieve seamless, facilitated goods movement across all transport modes and throughout the nation to boost export sales and national competitiveness.

This initiative began in May 2009 at a national conference co-led by Secretary of Commerce Gary Locke and Secretary of Transportation Ray LaHood, where government leaders met with top-level U.S. supply chain executives to discuss how our domestic supply chain, transportation, and investment policies must be improved to maximize America's competitiveness in the global economy.

At the conference, the executives emphasized that America needs to address each transport mode's problems as part of a comprehensive, cross-modal national policy that promotes seamless goods movement across and through the United States into the global economy. Both secretaries expressed their commitment to work toward this goal, together and with stakeholders, to improve the competitiveness of America's supply chains.

The Departments of Commerce and Transportation and other Committee on the Marine Transportation System agencies are currently working together and with stakeholders to identify the critical elements of a freight policy that would meet these national objectives. Under this policy, our marine system and its connecting infrastructure would be strategically improved as part of the larger effort to improve America's overall national freight infrastructure and our national competitiveness.

As part of this effort, the Departments of Commerce and Transportation are engaged in a comprehensive series of regional freight stakeholders outreach forums. Through these meetings, our departments are improving our knowledge of each region's top freight infrastructure issues and how these affect (and are affected by) national freight policy. Since September 2010, five major events in Atlanta, Chicago, San Diego, Kansas City, and Seattle have been held, with additional forums planned in 2011. Maritime shippers and seaports are actively engaged in the planning and execution of these events.

The Next Step: Improving the Connection

The success and health of our marine transportation system is vital to the National Export Initiative, and to our nation's effort to support and sustain American jobs by increasing U.S. exports. America's marine agencies and stakeholders are playing a crucial role in this effort.

Going forward, it is mission-critical that we all continue to work together through the Competitive Supply Chain Initiative to ensure that America's producers can succeed (and that the United States can remain competitive) by comprehensively improving the end-to-end freight connections that link American producers to the global marketplace.

About the author:

Mr. David Long manages a broad portfolio of leading American service sectors, with an emphasis on supply chain and logistics, and supports trade negotiations in services and efforts to enhance U.S. economic competitiveness. He has more than 15 years of senior-level private sector experience and served as a telecommunications trade negotiator with the U.S. Trade Representative from 1991-1994.

Endnotes:

¹ Federal Highways Administration, U.S. International Merchandise Trade by Transportation Mode: 2008.

² Report to the President on the National Export Initiative: The Export Promotion Cabinet's Plan for Doubling U.S. Exports in Five Years, September 2010.



The Ship's Agent

The maritime principal's eyes, ears, and hands in the port.

by MRS. JEANNE L. CARDONA

Executive Director

Association of Ship Brokers and Agents (U.S.A.), Inc.

A ship's agent is appointed by the ship owner to protect the owner's interests at the port of call, and is arguably one of the most valuable assets available to ship owners or operators.

He is entrusted with their reputation and protects their commercial interests through his actions, negotiations, and payments for services on their behalf. His expertise and reputation in his port as well as his relationship with port service providers and government officials enable him to successfully handle any issue with minimal loss of time. A quality ship agent enables ship owners, operators, and charterers to manage risk and realize significant and sustainable cost savings.

For example, in the "tramp" trades, where the owner's vessel is not engaged in the trade from one specific port to another (which is the case in liner trade), ship agents are even more important. The vessel may not have called at that port before, so the owner must rely on the expertise of his appointed ship agent, who needs to be intimately familiar with the services, personnel, and national and local requirements for the arriving vessel.

Time is Money

A major oil company offered the results of a study of its international operations that highlighted a potential annual savings of \$5,000,000 if it could enjoy just a 30-minute reduction of the worldwide turnaround time of vessels in port.¹ Ship owners, operators, and charterers all look to their ship's agent to expedite the vessel's port call and save them similar important and costly minutes.

The ship agent's job begins well before the vessel's arrival in port. Additionally, the agent must be available 24/7 and remain in constant communication with all concerned parties. The agent interfaces with local authorities to ensure that all advance notices have been received in good order and that the vessel has been cleared for entry. All pre-arrival and terminal information is then provided to the vessel. Ideally, the ship agent's coordination and oversight means that the vessel should arrive as scheduled and docks promptly, which equates to cost savings.



Mr. Ned Barham, T. Parker Host, Inc., boards a vessel in port to attend to entrance formalities. All photos courtesy of ASBA.

Once the vessel is in port, the ship's agent arranges appropriate port-based services, and in many cases, the agent is the first to attend the vessel upon berthing. A vessel captain relies on the ship agent for all of his needs while in port. For example, requirements for shore leave for seamen have changed in many countries since 9/11. For U.S. ports, seamen now require a visa to be granted shore leave; however, shore leave is not guaranteed. In some cases, terminals will limit seafarer access to its facility, which needs to be crossed to reach the port. Ship agents can assist in these and other areas, as they are familiar with terminal regulations in their ports.

Raising the Bar

Even in this very brief review of some of the functions of a ship's agent, it is obvious that this is a position with a great deal of responsibility and in which a ship's owner places a commensurate level of trust.

Think about it: The agent must have knowledge of all U.S. regulations for entering and clearing vessels and cargo, be equipped with and understand the latest computer technology, carry sufficient insurance coverage, and is typically advanced an average of \$50,000 from ship owners to purchase the required services for each port call. If you were a ship owner, wouldn't you want to appoint an agent who conforms to very high standards?

The Association of Ship Brokers and Agents (ASBA) has represented U.S. ship agent companies since 1934. Our agent members submit to a mandatory certification that requires that all member companies abide by our code of ethics, which includes a code of professional conduct as well as financial and insurance requirements.

This certification requires our agent members to submit to an annual procedural review by an outside certified public accountant, who must attest that the member's accounting procedures are such that all monies received from their principals are accounted for, supported by invoices and receipts, settled to their general ledger, and that the member utilizes generally accepted accounting principles. Additionally, ship agents employed by member ship agency companies must successfully complete an ASBA-administered "agent exam."



Mr. Jonathan Foster, Amelia Maritime Services, Inc., climbs the Jacob's ladder to board a vessel.

The Federation of National Associations of Ship Brokers and Agents, of which ASBA is a member, follows ASBA's lead by promoting a similar quality standard for ship agency providers around the world.

About the author:

Mrs. Jeanne Cardona has served as the director of the Association of Ship Brokers and Agents since 1999. She holds a B.S. in business administration from the University of Maryland. Under her direction, ASBA has grown its membership and as a voice in the maritime industry.

Endnote:

¹ Personal communication with Mr. Jason Kelly, Executive Vice President, Moran Shipping Agencies, Inc.

For more INFORMATION:

Visit the Association of
Ship Brokers and Agents at
www.asba.org

or the Federation of National Associations
of Ship Brokers and Agents at
www.fonasba.com



The St. Lawrence Seaway

A vital transportation treasure.

by MR. COLLISTER JOHNSON, JR.

Administrator, Saint Lawrence Seaway Development Corporation

Constructing the Saint Lawrence Seaway was a tremendous human endeavor. The goal: Extend deep-draft navigation from the Atlantic Ocean to the Great Lakes.

- Total cost to build the waterway was \$1 billion.
- Construction took three million cubic yards of concrete, and 112 million cubic yards of dirt had to be moved.
- It utilized enough steel to circle the equator.
- Some 6,500 residents had to be relocated, and 10,000 workers were needed for its construction.

The waterway was envisioned primarily as a bulk commodity system (ore in, grain out) despite many attempts to broaden the cargo base. The St. Lawrence Seaway, coupled with the New York Power Project development in upstate New York, produced massive hydroelectric generation capabilities as well as numerous non-economic benefits like beaches, parks, and boating facilities.

Perhaps the greatest historic legacy of the seaway, however, is its role as a model of international cooperation. The idea of a deep-draft seaway predated the

1950s by decades, but came to fruition then, just as the world was rebuilding after World War II.

President Eisenhower understood better than just about anyone that a significant benefit of building the seaway, while economically important, was the opportunity to forge a closer relationship with our neighbor to the north. As the former commander of WWII Allied forces in Europe, President Eisenhower knew first-hand the practical benefits of good transportation logistics, and he also understood how enduring alliances could be built around common economic goals.

A large part of the history of our successful relationship with Canada includes efforts to forge closer economic ties. Today, the Canadian-U.S. trade relationship is the largest in the world, symbolized by the unique binational waterway that is the Saint Lawrence River and the Great Lakes.

For example, a ship transiting from Montreal to Lake Erie traverses the international border 27 times. The system is comprised of a series of 15 locks managed through three traffic control areas. The U.S. Saint Lawrence Seaway Development Corporation (SLSDC) was created with unique authorities to manage this transportation route.

Aging Infrastructure

St. Lawrence Seaway System stakeholders gathered in Massena, N.Y., in July 2009 to celebrate the 50th anniversary of the seaway's inception. While 50 years is not old in human terms, for civil works projects, this milestone means that it is near the end of its planned work life. Realizing that a perpetual infrastructure asset, such as a lock, needs a capital investment equivalent to its original cost over its design life (typically 50 years), the SLSDC developed an asset renewal pro-

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The Great Lakes St. Lawrence Seaway System. Graphics courtesy of the Saint Lawrence Seaway Development Corporation.

Environmental Challenges

The joint ballast water inspection program administered by the U.S. and Canadian Seaway entities, the U.S. Coast Guard, and Transport Canada has been enhanced, and now subjects all ships for all transits outside the Canadian Exclusive Economic Zone to inspection. All tanks (ballast on board and no ballast on board) are inspected to verify proper flushing no matter their port of destination.

The ongoing work of the Ballast Water Collaborative is also gaining national attention. This group is comprised of Great Lakes stakeholders including representatives from state and provincial government; U.S. and Canadian federal regulatory agencies; representatives from the U.S.-flag laker, Canadian-flag laker, and international fleets; leading ballast water scientific researchers; non-governmental organizations; and ballast water treatment system vendors.

The collaborative meets periodically to facilitate open and substantive discussions about how to better protect against introduction and spread of aquatic invasive species. The Saint Lawrence Seaway Development Corporation (SLSDC) is also a supporter of the "Great Ships Initiative Program," an industry-led cooperative effort aimed at ending the problem of ship-mediated invasive species in the Great Lakes St. Lawrence Seaway System. The program conducts independent research and demonstration of environmental technology, financial incentives, and consistent basin-wide harbor monitoring.

Additionally, the SLSDC is part of the "green marine" initiative, a marine industry partnership program aimed at realizing measurable improvements in the shipping industry's environmental standards and performance.

The Statistics

Seaway dimensions currently permit ships up to 35,000 DWT.

Most vessels that transit are international carriers and Canadian lakers, and most cargo through the seaway originated from or is destined for U.S. markets.

Since the seaway opened in 1959, more than 2.5 billion tons of cargo with an estimated value of \$375 billion has been shipped through the waterway from more than 50 nations.

In an average year, over 40 million tons of cargo moves through the seaway.

Maritime commerce overall on the Great Lakes St. Lawrence Seaway System annually generates 150,000 jobs, \$4.3 billion in personal income, \$3.4 billion in business revenues, and \$1.3 billion in fed-

eral, state, and local taxes in the U.S. Great Lakes region.

In 2007, the joint U.S.-Canadian Great Lakes Saint Lawrence Seaway Study calculated that the system offers shippers an average savings of \$14.80/ton in transportation and handling charges, or approximately \$3 billion a year in savings. The U.S. Army Corps of Engineers has since updated that figure to \$3.6 billion a year in savings.

The fastest growing seaway cargo sector is project cargo (wind turbines), which underscores the continuing need for the seaway. Without a deep-draft waterway to transport these huge components economically, the recent Midwest wind energy boom would not be possible.

The seaway is a harbinger of the health of the overall economy. Seaway traffic numbers for the 2009 navigation season showed the most dramatic downturn in 25 years. The 17 percent rebound in overall tonnage realized in 2010 was a reflection of the gradually increasing health of the economy.

Statistics: <http://www.seaway.dot.gov/>

Vessels transit the St. Lawrence Seaway.



Container ship traveling between Windsor,
Canada, and Detroit, Michigan.

gram as part of its FY 2009 budget request to Congress to address the long-term asset renewal needs of the U.S. seaway infrastructure.

Congress approved the start of the program that will provide a complete rehabilitation of U.S. seaway lock, channel, and bridge infrastructure. During the program's first two years, the Saint Lawrence Seaway Development Corporation spent nearly \$34 million on 29 capital projects. The scheduled 10-year program includes more than 50 projects at a cost of nearly \$190 million. This long-range plan complements the ongoing Canadian effort to rehabilitate its 13 seaway locks.

The infrastructure rehabilitation will help position the St. Lawrence Seaway for future growth, as increasing congestion in other transportation modes along the corridor served by the seaway make it an increasingly attractive transportation option. Despite the recent global economic downturn, the need for the seaway and maritime transportation on the Great Lakes remains as significant as ever. Growth in bulk cargoes is expected to remain steady but modest; container shipments will also experience growth.

Short Sea Shipping

Unfortunately, shipment of high-value cargo in containers has been historically absent on the Great Lakes, even though many in the industry have looked at this possibility. A number of hurdles are cited, such as seasonality, logistics, costs, and lack of infrastructure.

Yet we are living in an interesting moment in transportation history. The capacity constraints of our surface transportation modes seem to have been reached. We are seriously reconsidering the way we make transportation energy consumption decisions. World trade will continue to grow, and maritime is the only viable link to world markets.

At the St. Lawrence Seaway, we are giving the possibility of containers a hard look. We are trying to facilitate intermodal collaboration and education about

the social, economic, and environmental benefits of moving more cargo by ship, and we are closely watching developments on the Harbor Maintenance Tax waiver legislation in Congress. But for this and certain other regulatory impediments identified by industry entrepreneurs, short sea shipping would be more prevalent.

Looking Ahead

The Great Lakes Seaway System has great potential for short sea shipping, as there is a high concentration of producers and users in the Great Lakes region as well as excellent rail and roadway connections. The tremendous congestion pressures in places like Chicago, Detroit, and Buffalo play into many of the marine industry's inherent advantages. Additionally, there is a diverse and mature commercial navigation industry capable of starting up short sea shipping services in the Great Lakes.

The St. Lawrence Seaway continues to prepare for the future by renewing aging infrastructure, adopting new marine technologies that make the waterway safer and allow for the transport of more cargoes, promoting ballast water treatment efforts to better protect the environment of the Great Lakes, and working to improve supply chain management in North America. These collective efforts provide the opportunity to reinforce our role in domestic, binational, and international commerce and to address the changes required for the seaway to remain a vital international transportation route.

About the author:

Collister Johnson, Jr., became the ninth administrator of the Saint Lawrence Seaway Development Corporation in 2006. He leads the federal government corporation responsible for maintaining and operating the two U.S. Seaway locks and vessel traffic control in areas of the St. Lawrence River and Lake Ontario, in collaboration with its Canadian partner, the St. Lawrence Seaway Management Corporation. Prior to his appointment, Mr. Johnson was a senior consultant at Mercer Management Consulting, Inc., in Washington, D.C. He earned a B.A. in American studies from Yale University, and a J.D. from the University of Virginia.

Bibliography:

www.seaway.dot.gov

The Harbor Maintenance Trust Fund

Collecting funds necessary to maintain our waterways.

by Ms. PAT MUTSCHLER
U.S. Army Corps of Engineers



The Harbor Maintenance Tax

The Harbor Maintenance Tax (HMT) was established by the Water Resources Development Act of 1986, and is applied on an *ad valorem* (or “according to value”) basis on the worth of commercial cargo involved in any port use of federally maintained harbor projects.

The phrase “port use” means loading or unloading of commercial cargo to or from a commercial vessel at a port. In this case, “port” refers to any U.S. harbor or channel (or component thereof) that is not a fuel-taxed inland waterway, and is open to public navigation. U.S. Customs and Border Protection maintains the list of applicable ports, which primarily include deep-draft port and harbor complexes.

One final definition: The “commercial cargo” that is subject to the fee is:

- any cargo transported on a commercial vessel,
- passengers transported for compensation or hire.

But not including:

- bunker fuel,
- ship’s stores,
- sea stores,
- the equipment necessary for the operation of a vessel,
- any fish or other aquatic animal life caught and not previously landed on shore.

How Much?

In 1986, 0.04 percent of the value of the cargo was subject to the tax. The Omnibus Budget Reconciliation Act of 1990 increased the tax from 0.04 to 0.125 percent, where it remains today.

This money is deposited into the Harbor Maintenance Trust Fund, or HMTF. As the name implies, these funds are spent to maintain our waterways.¹

The tax is generally imposed against most imports, foreign trade zone cargo, passengers not aboard ferries, and about 38 percent of domestic shipments.

However, the Water Resources Development Act also set forth several exclusions. For the purposes of the act:

- Ferries are not considered commercial vessels.
- No tax is imposed on cargo moving to and from Alaska, Hawaii, and other U.S. possessions (except for Alaskan crude oil).
- The tax is not imposed on any cargo associated with vessel movements to, from, or on the fuel-taxed inland waterways system.

Eligible Expenditures

Funds collected by U.S. Customs and Border Protection pursuant to the act are transferred to the trust for recovery of eligible expenditures in accordance with congressional appropriations and actual expenditures. Funds are transferred from the trust to the general treasury for current year expenditures based on monthly estimates.

Harbor Maintenance Trust Fund appropriations are authorized for 100 percent of the eligible operations and maintenance costs of those portions of the St. Lawrence Seaway operated and maintained by the St. Lawrence Seaway Development Corporation (SLSDC), and not more than 40 percent of the eligible operations and maintenance costs assigned to commercial navigation of all harbors and inland harbors within the United States.

Additionally, funds can be used to recover the federal share of construction costs for dredged material disposal facilities associated with the operation and maintenance of federal commercial navigation projects, including beneficial uses, the dredging and disposal of contaminated sediments that are in or affect the maintenance of federal channels, mitigation of operation and maintenance impact from federal navigation, and dredged material disposal facilities.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) interprets the term “commercial navigation” to mean any project authorized by Congress with commercial navigation as an authorized purpose. Most federal deep- and shallow-draft harbor projects are “single-purpose” commercial navigation projects. All operation and maintenance and the federal share of dredged material disposal area construction costs for such “single-purpose” navigation projects are subject to recovery from the trust fund.

There are also some projects with a commercial navigation purpose that have other authorized purposes as well, including flood control, hydropower, recreation, water supply, environment, and other allied water resources uses. For “multi-purpose” projects, only expenditures on behalf of commercial navigation and joint-use costs allocated to commercial navigation are subject to recovery from the trust fund. Expenditures for other specific and joint-use purposes, such as hydropower, are not eligible for HMTF monies. In addition, USACE incurs expenditures to administer the HMT.

St. Lawrence Seaway Development Corporation

As mentioned, the Water Resources Development Act of 1986 authorized funding 100 percent of the operation and maintenance expenditures for the St. Lawrence Seaway Development Corporation from the Harbor Maintenance Trust Fund. Prior to FY 2003, funds were transferred to the Department of Transportation as payments for SLSDC rents. These rent payments are now

included in the total SLSDC transfers and amounted to \$16,223,160 in FY 2007 and \$17,392,000 in FY 2008.

Prior to FY 1995, the tolls collected on that portion of the St. Lawrence Seaway under U.S. jurisdiction were deposited into the HMTF, but then fully rebated back to the vessel operating companies paying the tolls in accordance with Section 805 of WRDA 1986. However, with the passage of the Department of Transportation and Related Agencies Appropriations Act for FY 1995, the collection of tolls on the U.S. portion of the seaway was eliminated, effective October 1, 1994. Approximately \$9.55 million in seaway tolls were rebated back to the vessel operating companies during FY 1994, the last full year of toll collections on the U.S. portion. Toll rebates from the trust fund averaged about \$9.5 million per year from FY 1988-1994.

National Oceanic and Atmospheric Administration

The original legislative proposal for the Water Resources Development Act of 1990 included several amendments to the Harbor Maintenance Trust Fund. These included increasing the *ad valorem* fee from 0.04 percent to 0.125 percent, increasing the recovery level for USACE from 40 percent to 100 percent, providing funds for the National Oceanic and Atmospheric Administration’s (NOAA) marine navigation services, and providing for reimbursement of administrative costs. However, Congress did not pass all of the proposed amendments. Section 316 of the Water Resources Development Act of 1990 authorized the increase in the recovery level for USACE to 100 percent while the Omnibus Budget Reconciliation Act of 1990 increased the *ad valorem* fee to 0.125 percent, beginning January 1991. However, NOAA never received authorization to recover costs from the Harbor Maintenance Trust Fund.

Department of Homeland Security

During the 103rd Congress, legislation was enacted that allows the CBP, USACE, and U.S. Department of Commerce to share a maximum total of \$5 million per year for expenses incurred in the administration of the Harbor Maintenance Tax. Under the North American Free Trade Agreement Implementation Act, funds were to be made available as of the beginning of FY 1995; however, enactment was too late to include monies in the FY 1995 appropriations.

Since FY 1996, \$3 million has been transferred annually to the CBP for administration of the tax. In addition, USACE received funds to collect domestic shipper information required for auditing HMT collections, to track operation and maintenance expenditures, to pre-



pare the annual HMTF report to Congress, to coordinate with the CBP on data collection and enforcement issues, and for addressing and evaluating possible alternatives to the tax.

Court Challenges

On October 25, 1995, the U.S. Court of International Trade (CIT) issued a summary judgment in the case *United States Shoe Corp. v. The United States*, 907 F. Supp. 408, finding the HMT unconstitutional under the export clause of the Constitution. Article I, Section 9, Clause 5 provides that “No Tax or Duty shall be laid on Articles exported from any State.” The CIT also enjoined the Customs Service from collecting the fee. However, in response to a motion filed by the U.S. Department of Justice, the CIT agreed to let the Customs Service continue to collect the fee until the conclusion of any appellate proceedings.

On June 3, 1997, the U.S. Court of Appeals for the Federal Circuit affirmed the CIT’s ruling in a 4-to-1 decision² and on March 31, 1998, that decision was affirmed by the U.S. Supreme Court.³ In its unanimous decision, the Supreme Court confirmed that levying a tax on the value of commercial cargo loaded for export violated the export clause of the Constitution.

The *U.S. Shoe* decision affects only exports, which represented approximately 30 percent of HMTF revenues during fiscal years 1996 and 1997. The export clause does not, however, prohibit a user fee, provided the fee lacks the attributes of a generally applicable tax or duty and is, instead, a charge designed as compensation for government-supplied services.

As a result of the Supreme Court ruling, the Customs Service published a notice in the Federal Register advising exporters that they should stop paying the Harbor Maintenance Tax effective April 25, 1998, and the tax is no longer being collected on exported goods. Under existing law, the CBP continues to collect the HMT on imports, domestic shipments, foreign trade zone cargo, and passengers.

Harbor Maintenance Tax collections for exports received during the judgment period totaled \$1.08 billion according to the CBP Accounting Services Division. HMT refunds from Department of the Treasury Fund “Refund of Monies Erroneously Received and Covered (Indefinite)” are available to claimants. They must follow CIT procedures requiring the filing of a claim by the claimant and review and approval by the court.

There have been other court challenges to the law, including passenger vessel passenger eligibility, validity of taxation on interstate shipments, and exemptions for imports of foreign military articles.

World Trade Organization Consultations on the HMT

In 1992, the European Community (now European Union) members of the General Agreement on Tariffs and Trade requested a “consultation” on the HMTF surplus through the Office of the U.S. Trade Representative. At that time the trust fund’s surplus was about \$70 million. After those consultations occurred the EC did not pursue the matter, and no further formal action was taken.

On February 6, 1998, prior to the U.S. Supreme Court’s *U.S. Shoe* decision, the EU requested World Trade Organization (WTO) consultations with the United States on the impact of the tax on EU imports into the United States. The EU claims that the HMT violates Articles I, II, III, VIII, and X of the General Agreement on Tariffs and Trade (1994) and estimates that the HMT costs European exporters \$86 million annually.

On March 25, 1998, a first round of consultations took place with the EU in Geneva, Switzerland, with Canada, Japan, and Norway also participating. During these consultations the United States responded to questions posed by its trading partners regarding the Harbor Maintenance Tax and how it is assessed and used, but declined to engage in a discussion of the international legal merits of the case or to speculate on how a U.S. Supreme Court decision might affect WTO obligations.

On April 8, 1998, after the U.S. Supreme Court decision in *U.S. Shoe*, the EU requested a second round of consultations. These consultations, which again included Japan, Canada, and Norway, were held on June 10, 1998. In these and other discussions with U.S. trading partners, the U.S. Trade Representative made it clear that any changes made to the HMT as a result of *U.S. Shoe* would be done to comply with the ruling of the U.S. Supreme Court and to maintain consistency with World Trade Organization obligations. Under WTO dispute settlement rules, the European Union could move to request establishing a dispute settlement panel to examine its legal claims. The EU indicated that if satisfactory legislation was not passed by January 1, 2000, it would ask for a panel. However, no panel had been requested to date.

If a World Trade Organization member nation is found to be in violation of WTO rules, it may be granted a “reasonable period of time” to correct the violation. Generally a member nation has a maximum of 15 months within which it must correct the violation or face trade retaliation. If the violating party fails to take such corrective action by the end of this 15-month period, any party having invoked the dispute settlement procedure may request authorization to suspend the application of concessions or other obligations under the WTO agreements with respect to the violating party.

Total Waterborne Commerce

Total waterborne commerce for the U.S. in calendar year 2008 decreased 87 million tons (3.4 percent) to 2.477 billion short tons. The decrease in waterborne commerce tonnage between 2007 and 2008 was due to a decrease of 21 million tons in foreign waterborne commerce to 1.521 billion tons and a decrease of 66 million tons in domestic waterborne commerce to 956 million tons. Foreign waterborne commerce in 2008 was valued at a record \$1.613 trillion, equivalent to approximately 11 percent of U.S. Gross Domestic Product.

States and Territories

Forty-five states and territories recorded waterborne commerce in 2008, of which nine states handled more than 100 million tons. Louisiana led all states with 480.7 million tons of waterborne commerce, followed by Texas with 473.3 million tons, and California with 221.3 million tons. Eight states and territories handled 50 to 99 million tons and 12 others handled 25 to 49 million tons. Cargo tonnage assigned to each state is the summation of shipping (domestic and foreign), receiving (domestic and foreign), and intrastate traffic.

Recent Trends

Total HMT collections exceeded \$1 billion for the fourth consecutive year as they reached a record \$1.467 billion. That was a 16.2 percent increase (\$205 million) over \$1.262 billion in FY 2007. Collections from all four sources increased year over year between FY 2007 and 2008. Imports tend to consist of higher-value commodities (such as electronics, automobiles, etc.), while U.S. exports and domestic cargos have generally tended to be lower-value bulk cargoes (grain, coal, chemicals, and petroleum products).

Expenditures for USACE Operation and Maintenance

Total USACE expenditures eligible for recovery from the Harbor Maintenance Trust Fund totaled \$757.6 million in FY 2007 and \$788 million in FY 2008.

Legislative language in the annual Energy and Water Development Appropriations conference reports establishes guidance under which funds are permitted to be withdrawn from the HMTF.

The FY 2005 conference report language permitted funds to be used for coastal—but not inland—harbors. The FY 2006 conference report language permitted funds to be used for both coastal and inland harbors. Neither conference report cited use of funds for Great Lakes harbors and channels. The HMTF Report for FY 2005 and 2006 construed the conference report language as including Great Lakes harbors with coastal harbors for funding from the Harbor Maintenance Trust Fund.

Maintenance Dredging

About four-fifths of the total harbor and channel operation and maintenance costs are attributed to maintenance dredging. Private industry moves about 82 percent of the quantity dredged for about 88 percent of the costs for the maintenance dredging. USACE conducted the remaining 18 percent of the maintenance dredging for 12 percent of the expenditures.

Projections

It is projected that the balance in the Harbor Maintenance Trust Fund will grow from approximately \$4.65 billion at the end of FY 2008 to \$7.48 billion at the end of FY 2013. Revenues substantially exceeded transfers in FY 2007 and FY 2008, as they have for a number of years. Amounts transferred from the trust fund depend upon the amounts appropriated by Congress for authorized activities, irrespective of the level of funds in the trust fund.

About the author:

Ms. Patricia Mutschler has worked for the U.S. Army Corps of Engineers for 22 years, serving in the Philadelphia District, the Baltimore District as chief economist, the Institute for Water Resources, and at headquarters. She is the USACE liaison to the U.S. Coast Guard and sits on the CMTS Executive Secretariat.

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Report to Congress on the annual status of the Harbor Maintenance Trust Fund for fiscal 2005, 2006, 2007, and 2008 draft, May 2010, revised August 2010. Prepared by the USACE Institute for Water Resources.

Endnotes:

¹ The revenue generated from this 0.04 percent tax rate was intended to be sufficient to recover not more than 40 percent of eligible U.S. Army Corps of Engineers operation and maintenance (O&M) costs assigned to commercial navigation, and 100 percent of the St. Lawrence Seaway Development Corporation's eligible O&M costs for the St. Lawrence Seaway. However, Section 11214 of the Omnibus Budget Reconciliation Act of 1990 subsequently increased the HMT from 0.04 to 0.125 percent, effective January 1, 1991, in conjunction with an authorized increase in the recovery level of USACE O&M expenditures on behalf of commercial navigation up to 100 percent in accordance with Section 316 of WRDA 1990 (P.L. 101-640).

² 114 F. 3d 1564.

³ U.S. v. U.S. Shoe Corp., 523 U.S. 360.



Inland Waterways Infrastructure Revitalization

The Inland Waterways Capital Development Plan.

by MR. STEPHEN D. LITTLE

Chairman, Inland Waterways Users Board

President and Chairman of the Board, Crounse Corporation

The federally mandated Inland Waterways Users Board makes recommendations to the Secretary of the Army about construction, rehabilitation priorities, and spending levels on the commercial navigation features and components of the inland waterways and inland harbors. As chairman, I've had the privilege of working with approximately 50 experts from the U.S. Army Corps of Engineers (USACE) and the navigation industry to develop a comprehensive, consensus-based package of recommendations to address the need for continued vitality of the inland navigation system in the United States.

On April 13, 2010, the board unanimously adopted these recommendations and released its final report, the "Inland Waterways Capital Development Plan" to Congress, in hopes of being included in a potential Water Resources Development Act. If adopted, the plan will provide additional funding for greatly needed infrastructure improvements.

Out of Sight, Out of Mind

America's inland waterways system has many tangible benefits and an even longer list of beneficiaries. More than 600 million tons of freight commodities valued at more than \$70 billion are transported each year on America's "water highways." That system moves about 20 percent of the coal burned to generate electricity in utility plants and around 22 percent of domestic petroleum products. The inland system also moves approximately 44 percent of the nation's grain for export, helping our nation's farmers to compete on the world market.¹

Unfortunately the inland waterways system is showing its age. Many of the locks and dams were built in the 1930s, and quite a number of them are more than 20 years beyond their design life. Electronic components are failing, concrete structures are crumbling, and unscheduled emergency shutdowns occur as frequently as those that are scheduled.

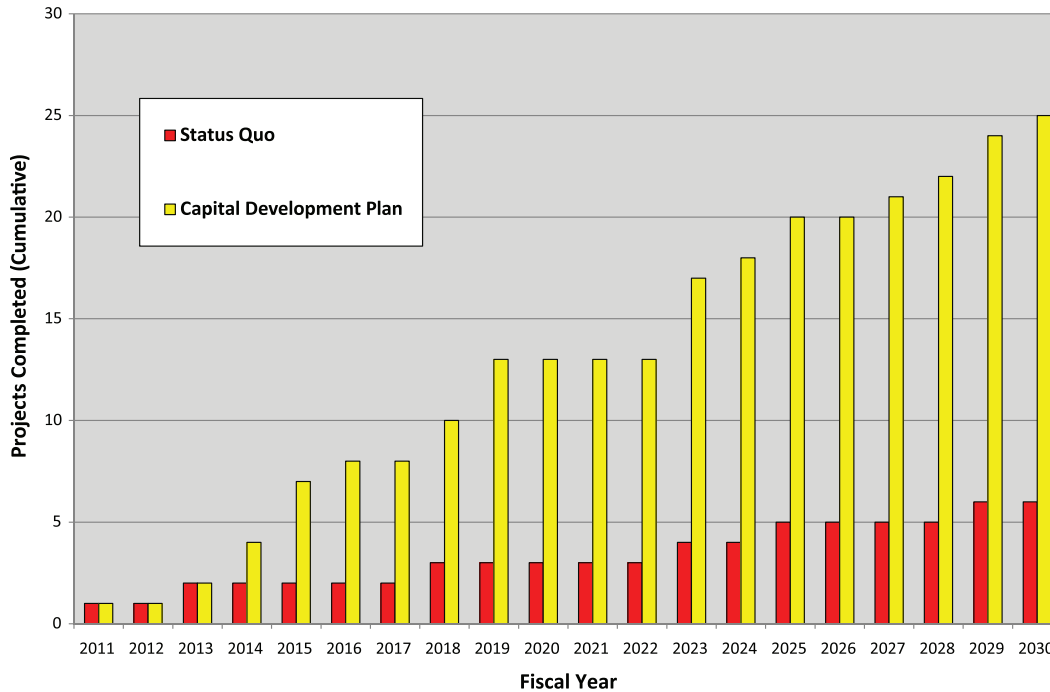
Additionally, many of our locks are too small for larger tows. On the upper Mississippi River, for example, nearly all the lock chambers are only 600 feet in length, while the average length of a modern tow is 1,200 feet. Consequently, tows must navigate these antiquated locks by splitting in half and transiting one section at a time. If not addressed, these problems will continue, resulting in significant and costly delays.

Throwing Good Money After Bad

Unfortunately the current project funding and delivery system is too inefficient, resulting in much wasted time and money. And while the industry has made significant investment in the reliability of the system through a diesel fuel tax paid into the Inland Waterways Trust Fund, far too few projects have been completed. Those that are undertaken can stretch out over decades, wasting taxpayer dollars and losing transportation cost-savings for our national economy.

For example, the Olmsted Locks and Dam project on the Ohio River is estimated to save shippers \$500 million annually in fuel, labor, and shipping expenses. Instead of providing that relief, however, the project has dragged on due to under-funding, changing require-

Project Comparison Status Quo vs. Capital Development Plan



The capital development plan offers a path to complete 25 navigation projects in 20 years.

ments, and continually rising costs. The project was initially expected to cost \$775 million over 12 years and is now projected at \$2.1 billion over 26 years.²

The Plan

To address this type of problem, the Inland Waterways Capital Development Plan:

- Proposes a national prioritized list of navigation projects based on objective criteria such as economic benefit and project condition.
- Offers a path to complete 25 navigation projects in 20 years, on time and on budget, rather than the six projects under the current business model.
- Seeks standardization and design centers of expertise.
- Creates jobs and allows for increased exports to market.
- Better utilizes taxpayer dollars to drive commerce.

The proposal includes a project-by-project cost-sharing cap to provide protection to the trust fund from unreasonable cost escalation and project delays. It places additional emphasis on the need to produce more reliable

project cost estimates in the underlying decision document, which would allow for effective management of projects within the identified cost estimates and schedules.

To date, the plan is supported by more than 200 industry stakeholders including national, state, regional, and local organizations and companies. They include the U.S. Chamber of Commerce, National Association of Manufacturers, Transportation Research Board / Marine Board, American Land Conservancy, National Audubon Society, National Corn Growers Association, National Grain and Feed Association, Steel Manufacturers Association, National Mining Association, and National Council of Farm Cooperatives.

To bring vital navigation projects online and completed in an efficient way, positive change must start now. Our inland waterways are crucial to the entire maritime industry, our nation's economy, and especially to those who depend on those inland waterways to transport goods efficiently and in the most environmentally friendly way possible.

continued on page 53

The Inland Waterways Fuel Tax

The Inland Waterways Fuel Tax was established to support inland waterway infrastructure development and rehabilitation. Commercial users are required to pay this tax on fuel consumed during inland waterway transportation. Revenues from the tax are deposited in the Inland Waterways Trust Fund and fund 50 percent of the cost of inland navigation projects each year as authorized. The amount of tax paid by commercial users is \$.20 per gallon of fuel, generating approximately \$85 million in contributions annually to the trust fund.

Reflecting the concept of “No Taxation Without Representation,” the Water Resources Development Act of 1986 (Public Law 99-662) established the Inland Waterways Users Board, a federal advisory committee, to give commercial users a strong voice in the investment decision-making they were supporting with their cost-sharing tax payments. The board’s principal responsibility is to recommend the prioritization of new and replacement inland navigation construction and major rehabilitation projects to Congress, the Secretary of the Army, and the U.S. Army Corps of Engineers.



The Fuel-Taxed Inland and Intracoastal Waterways

1. **Alabama-Coosa Rivers:** From junction with the Tombigbee River at river mile (RM) 0 to junction with Coosa River at RM 314.
2. **Allegheny River:** From confluence with the Monongahela River to form the Ohio River at RM 0 to the head of the existing project at East Brady, Penn., RM 72.
3. **Apalachicola-Chattahoochee and Flint Rivers:** Apalachicola River from mouth at Apalachicola Bay (intersection with the Gulf Intracoastal Waterway) RM 0 to junction with Chattahoochee and Flint Rivers at RM 107.8. Chattahoochee River from junction with Apalachicola and Flint Rivers at RM 0 to Columbus, Ga., at RM 155 and Flint River, from junction with Apalachicola and Chattahoochee Rivers at RM 0 to Bainbridge, Ga., at RM 28.
4. **Arkansas River (McClellan-Kerr Arkansas River Navigation System):** From junction with Mississippi River at RM 0 to Port of Catoosa, Okla., at RM 448.2.
5. **Atchafalaya River:** From RM 0 at its intersection with the Gulf Intracoastal Waterway at Morgan City, La., upstream to junction with Red River at RM 116.8.
6. **Atlantic Intracoastal Waterway:** Two inland waterway routes approximately paralleling the Atlantic coast between Norfolk, Va., and Miami, Fla., for 1,192 miles via both the Albemarle and Chesapeake Canal and Great Dismal Swamp Canal routes.
7. **Black Warrior-Tombigbee-Mobile Rivers:** Black Warrior River System from RM 2.9, Mobile River (at Chickasaw Creek) to confluence with Tombigbee River at RM 45. Tombigbee River (to

Demopolis at RM 215.4) to port of Birmingham, RMs 374-411 and upstream to head of navigation on Mulberry Fork (RM 429.6), Locust Fork (RM 407.8), and Sipsey Fork (RM 430.4).

8. **Columbia River (Columbia-Snake Rivers Inland Waterways):** From the Dalles at RM 191.5 to Pasco, Wash. (McNary Pool), at RM 330, Snake River from RM 0 at the mouth to RM 231.5 at Johnson Bar Landing, Idaho 14.

9. **Cumberland River:** Junction with Ohio River at RM 0 to head of navigation, upstream to Carthage, Tenn., at RM 313.5.

10. **Green and Barren Rivers:** Green River from junction with the Ohio River at RM 0 to head of navigation at RM 149.1.

11. **Gulf Intracoastal Waterway:** From St. Mark's River, Fla., to Brownsville, Texas, 1,134.5 miles.

12. **Illinois Waterway (Calumet-Sag Channel):** From the junction of the Illinois River with the Mississippi River RM 0 to Chicago Harbor at Lake Michigan, approximately RM 350.

13. **Kanawha River:** From junction with Ohio River at RM 0 to RM 90.6 at Deepwater, W.V.

14. **Kaskaskia River:** From junction with Mississippi River at RM 0 to RM 36.2 at Fayetteville, Ill.

15. **Kentucky River:** From junction with Ohio River at RM 0 to confluence of Middle and North Forks at RM 258.6.

16. **Lower Mississippi River:** From Baton Rouge, La., RM 233.9 to Cairo, Ill., RM 953.8.

Inland Waterway System



17. **Upper Mississippi River:** From Cairo, Ill., RM 953.8 to Minneapolis, Minn., RM 1,811.4.

18. **Missouri River:** From junction with Mississippi River at RM 0 to Sioux City, Iowa, at RM 734.8.

19. **Monongahela River:** From junction with Allegheny River to form the Ohio River at RM 0 to junction of the Tygart and West Fork Rivers, Fairmont, W.V., at RM 128.7.

20. **Ohio River:** From junction with the Mississippi River at RM 0 to junction of the Allegheny and Monongahela Rivers at Pittsburgh, Penn., at RM 981.

21. **Ouachita-Black Rivers:** From the mouth of the Black River at its junction with the Red River at RM 0 to RM 351 at Camden, Ark.

22. **Pearl River:** From junction of West Pearl River with the Rigolets at RM 0 to Bogalusa, La., RM 58.

23. **Red River:** From RM 0 to the mouth of Cypress Bayou at RM 236.

24. **Tennessee River:** From junction with Ohio River at RM 0 to confluence with Holstein and French Rivers at RM 652.15.

25. **White River:** From RM 9.8 to RM 255 at Newport, Ark.

26. **Willamette River:** From RM 21 upstream of Portland, Ore., to Harrisburg, Ore., at RM 194.

27. **Tennessee-Tombigbee Waterway:** From its confluence with the Tennessee River to the Warrior River at Demopolis, Tenn.

The Inland Waterways Capital Development Plan proposal is the right direction for maintaining America's competitive edge in the world. We board members urge Congress to support this important initiative to keep America—and its goods—moving!

About the author:

Mr. Stephen D. Little is president and chairman of the board of Crounse Corporation. Prior to joining Crounse, Mr. Little was counsel on the U.S. House of Representatives Merchant Marine and Fisheries Committee for five years. A member of the Inland Waterways Users Board since 2007, he currently serves as chairman. He also serves on the Board of Directors of Waterways Council, Inc., and is active in The American Waterways Operators.

Endnotes:

¹ U.S. Army Corps of Engineers Navigation Planning Center.

² Inland Waterways Users Board Annual Report to the Secretary of the Army and the United States Congress, May 2008.

For more INFORMATION:

The full plan along with the complete list of supporters can be found at:

www.waterwayscouncil.org

Infrastructure Moves Agriculture

*Reliable waterways provide resiliency
and enhance recovery after disruptions.*

by MR. BRIAN M. MCGREGOR
Supervisory Agricultural Marketing Specialist
U.S. Department of Agriculture

The Big Picture

Marine transportation is important to fiscal 2011 agricultural exports, forecast at \$137 billion—an all-time record high. Agriculture is forecast to provide a \$44 billion trade surplus to the American economy, with imports estimated at \$93 billion.¹ Forestry and fishery products and critical farm inputs such as fertilizer, feed, and fuel move on the waterway system as well.

Exporters, importers, and domestic shippers depend on authorized port and waterway depths and widths as well as locks and dam infrastructure. In calendar year 2010, 81 percent of U.S. agricultural exports (158 million metric tons) and 77 percent of imports (37 million metric tons) were waterborne.²

U.S. Grain Exports

The United States exports approximately one quarter of the grain it produces. On average, this includes nearly 45 percent of U.S.-grown wheat, 35 percent of U.S.-grown soybeans, and 20 percent of U.S.-grown corn. Approximately 61 percent of grain inspected for export departed from the U.S. Gulf in 2010—more than 2.8 billion bushels. Pacific Northwest ports ac-

counted for nearly 26 percent of U.S. grain inspected for export in 2010, or nearly 1.2 billion bushels.³

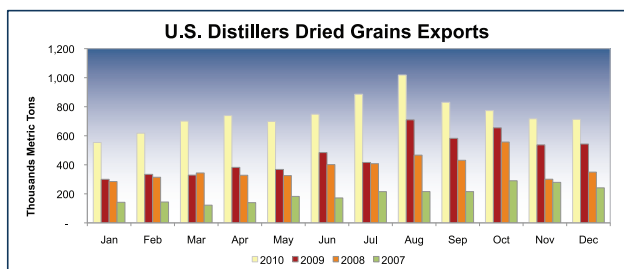
The May 11, 2011 USDA world agricultural supply and demand estimates for 2010–11 U.S. exports include:

- Feed grains—52 million metric tons (57.3 million short tons)
- Corn—1.9 billion bushels (53.2 million short tons)
- Soybeans—1.55 billion bushels (46.5 million short tons)
- Wheat—1.3 billion bushels (39 million short tons)
- Soybean meal—9.15 million short tons
- Rice—114.5 million hundredweight (5.7 million short tons)
- Sorghum—140 million bushels (3.9 million short tons)
- Soybean oil—3.3 billion pounds (1.65 million short tons)

Ethanol, Distillers, Dried Grains, Corn Production, Fertilizer, and Barge Traffic

U.S. ethanol production capacity at operating refineries is more than 13.8 billion gallons per year, and an additional 637 million gallons of capacity will be available upon completion of new construction and expansion projects.⁴ Nearly 397 million gallons of ethanol were exported between January and November 2010, compared to over 113 million gallons in calendar year 2009.⁵

Barges move an estimated five percent of ethanol.⁶ Major multimodal ethanol terminals include Albany, N.Y.; Baltimore, Md.; Chicago, Ill.; Houston, Texas; Linden, Newark, and Sewaren, N.J.; New Orleans, La.; and Providence, R.I.



All graphics courtesy of USDA.

Barges also move some of the fertilizer needed to grow corn to produce ethanol and some of the distillers dried grains (DDG), an ethanol co-product used for animal feed. For every gallon of corn ethanol, about 6.34 pounds of DDG are produced.⁷

Nearly 9 million metric tons of DDG were exported in 2010, compared to nearly 5.7 million metric tons in calendar year 2009.⁸

Increased ethanol production means increased corn acreage and transportation of fertilizer to grow the corn. USDA projects a corn harvested area of 81.4 million acres, yielding 152.8 bushels per acre, with 5 billion bushels to be converted to ethanol in 2010–11.⁹

Corn uses about 240 pounds of fertilizer per planted acre, as it has high nitrogen fertilizer requirements.¹⁰ The United States imported nearly 40 million short tons of fertilizer in 2010, including nearly 19 million short tons of nitrogen, compared to 14 million short tons of nitrogen in 2009.¹¹

Barge and Rail Competition

According to U.S. Army Corps of Engineers' statistics, in calendar year 2010 the total barge traffic (upbound and downbound) at Mississippi lock 27, Ohio lock 52, and Arkansas lock 1 included:

- Corn—23.8 million short tons
- Oilseeds—soybeans, flaxseed, and others—11.3 million short tons
- All chemical fertilizers—8.8 million short tons
- Processed grain and animal feed—5.8 million short tons
- Wheat—1.4 million short tons
- Rye, barley, rice, sorghum, and oats—0.5 million short tons
- Other agricultural, food, fish, forest, and paper products—2.0 million short tons

Additionally, a substantial amount of export grain enters the Mississippi River below Mississippi River lock 27, Ohio River lock and dam 52, and Arkansas lock and dam 1. In calendar year 2010, 21,844 downbound grain barges passed through locks 27, 52, and 1 with over 34.8 million short tons of grain. In comparison, 29,287 grain barges were unloaded in the New Orleans region during 2010, a difference of 7,443 barges, with an estimated 13.2 million short tons of grain.

The USDA estimates that railroads originate approximately 35 percent of U.S. grain shipments. Railroads take into account barge rates and the spread between



U.S. Gulf and Pacific Northwest ocean vessel freight rates, and price their services accordingly. The USDA report "Transportation of U.S. Grains, A Modal Share Analysis, 1978-2007" showed that barges moved 44 percent of all grain exports:

- Barges moved 55 percent of corn to ports and one percent of corn to processors, feed lots, and dairies in 2007. Rail shares were 35 percent for exports and 26 percent for domestic moves.
- Barges moved 46 percent of soybeans to ports and two percent of soybeans to processors in 2007. Rail shares were 41 percent for exports and 14 percent for domestic moves.
- Barges moved 28 percent of wheat to ports and one percent of wheat to processors in 2007. Rail shares were 66 percent for exports and 65 percent for domestic moves.
- Barges moved 19 percent of sorghum to ports in 2007. Rail shares were 47 percent for exports and nine percent for domestic moves.

Additional studies have shown that without barge competition, agricultural shippers pay higher rail transportation costs the farther they are from an inland waterway.¹²

Top U.S. Ports for Agricultural Exports

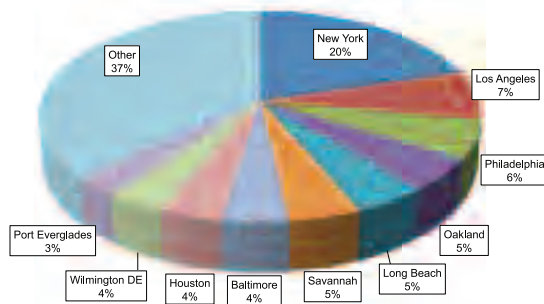
According to USDA statistics, in calendar year 2010 U.S. waterborne agricultural exports totaled 158 million metric tons, 21 percent of which were moved in containers. During the same period, containers were used to transport five percent of total waterborne grain exports and seven percent of total grain exports to Asia.

The top five U.S. ports for bulk and containerized agricultural exports were South Louisiana, New Orleans, Kalama, Seattle, and Houston. In terms of containerized movements, the top five ports were Los Angeles, Long Beach, Oakland, Seattle, and Norfolk.

Additionally, in calendar year 2010, U.S. bulk and containerized waterborne agricultural imports totaled 37 million metric tons. In terms of container movements,

the Port of New York brought in more agricultural cargo than Los Angeles, Long Beach, and Oakland, Calif. combined. The top five U.S. ports for bulk and containerized agricultural imports were New York, Los Angeles, Philadelphia, Oakland, and Houston.

Top 10 U.S. Ports Moving Waterborne Agricultural Imports, 2010, % of Total Metric Tons



Source: Port Import Export Reporting Service (PIERS)

Harbor Channel and Inland Waterway Draft Issues

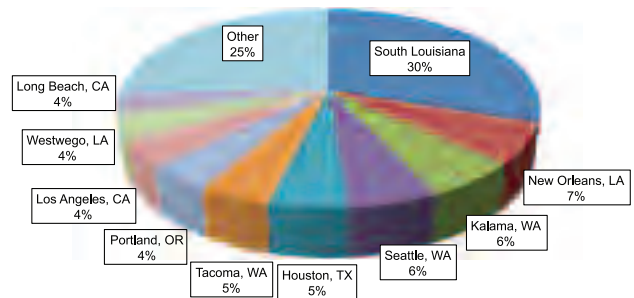
Inadequate water depths can lead to higher transportation costs, as barges and vessels may be loaded to less than capacity and more barges and vessels may be required to ship the same amount of commodities. In recent years there have been extended periods where low river levels impeded grain barge movements. When river levels are low, barges must be loaded lighter than normal and the number of barges in a tow may be reduced.

At a nine-foot draft, a barge has 1,500 short tons of capacity; for each inch of reduced draft, the barge loses about 16.7 short tons of capacity.¹³ According to the U.S. Maritime Administration, when harbor channels are at less than authorized depths, S-Class container vessels lose 320 tons of cargo capacity per inch, Panamax bulk grain carriers lose 179 tons per inch, and Great Lakes ocean-bound vessels lose 115 tons per inch.

Effects of Temporary Closures on Costs, Receipts, and the Federal Budget

U.S. exporters compete on the basis of world prices. Temporary closures of channels due to low water conditions, groundings, natural and man-made disasters, strikes, and lockouts can lead to delays, spoilage, diversion to other modes and ports, higher transportation costs, and lost sales. Higher transportation costs can result in lower cash bids in interior markets.¹⁴ As cash prices fall, USDA loan deficiency payments may increase.

Top 10 U.S. Ports Moving Waterborne Agricultural Exports, 2010, % of Total Metric Tons



Source: Port Import Export Reporting Service (PIERS)

U.S. exporters may be unable to pass on higher transportation costs, as customers can purchase similar products from other countries. In contrast, U.S. importers may be able to pass on higher transportation costs to their customers.

Users of railroads and highways face congestion, constrained capacity, and driver and equipment shortages. Authorized channel depths and widths and locks and dams maintained by the U.S. Army Corps of Engineers moderate the effects of congestion, provide resiliency, and enhance recovery after transportation disruptions.

About the author:

Mr. Brian McGregor participated in the joint USDA/DOT study of rural transportation issues presented to Congress in April 2010. The study examined the importance of rail, truck, barge, and ocean transportation to agriculture; sufficiency of competition, capacity, and investment; reliability of service; reasonableness of freight rates; and dispute resolution.

Endnotes:

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2. Compiled by USDA Agricultural Marketing Service, Transportation Services Division, using data from the U.S. Department of Commerce, Census Bureau, Foreign Trade Statistics, and PIERS.
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5. U.S. Department of Commerce, Census Bureau, *Foreign Trade Statistics*, January 12, 2011.
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9. USDA World Agricultural Outlook Board, *World Agricultural Supply and Demand Estimates*. May 11, 2011.
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The U.S. Army Corps of Engineers

Delivering innovative, sustainable solutions to the nation's engineering challenges.

by MAJOR GENERAL WILLIAM T. GRISOLI
*Deputy Commanding General
Civil and Emergency Operations
U.S. Army Corps of Engineers*

Other Federal
Agency Roles

The U.S. Army Corps of Engineers (USACE) has eight authorized Civil Works mission areas:

- navigation,
- flood risk management,
- environmental protection and restoration,
- hydropower,
- regulatory,
- recreation,
- water supply,
- emergency operations.

We accomplish these missions with an annual civil works appropriation of about \$5.7 billion. We have about 23,200 civilian employees and 300 military personnel devoted to civil works. Our organization is made up of nine regional offices (called divisions) whose boundaries are based on watersheds and divided into 38 local offices or “districts.”

In fiscal year 2010, the U.S. Army Corps of Engineers had 1,167 projects under construction. Of these, 434 were specifically authorized by Congress, and 733 were “continuing authorities” projects. Of the congressionally authorized projects:

- 191 were flood risk management projects;
- 5 were hydropower projects;
- 147 were navigation projects;
- 52 were environmental infrastructure projects;
- 39 were environmental projects.

Our Navigation Mission

USACE's earliest civil works mission is supporting navigation by maintaining and improving channels, dating to a federal law in 1824 authorizing it to improve

safety on the Ohio and Mississippi Rivers and several ports. Today, the U.S. Army Corps of Engineers operates and maintains about 12,000 miles of inland channels. We also operate 241 lock chambers at 192 sites. Sadly, the nation's infrastructure is aging; the average age of USACE locks is now about 58 years. In addition, USACE maintains 926 coastal, Great Lakes, and inland harbors, which handle more than 250,000 tons of cargo annually.

To maintain and improve federal navigation projects, the U.S. Army Corps of Engineers dredged 263.6 million cubic yards of material in 2009—enough to fill a football field to a depth of 12 miles. More than 82 percent of the material was dredged by 51 separate firms, 33 of which were small businesses. Thus, nearly 90 percent of USACE dredging funds go to private industry.

Collaboration

We cannot accomplish our missions on our own, however. We need our stakeholder and project sponsors to help address the future needs of the marine transportation system. We also work closely with other federal agencies to utilize the limited resources we are given to meet our missions.

Vision

The U.S. Army Corps of Engineers' vision is “A great engineering force of highly disciplined people working with our partners through disciplined thought and action to deliver innovative and sustainable solutions to the nation's engineering challenges.”

The cornerstone of this vision rests in us not going it alone. We need our partners. We need our stakeholders. In these days of tight budgets and limited resources, no single agency or entity can collect all of the data they require—or solve all of the problems they face—alone. We must work together to coordinate efforts and to share our expertise, models, data, knowledge, and good ideas.

There is no single federal entity responsible for the planning, construction, operation, maintenance, and use of the U.S. marine transportation system (MTS). Those responsibilities are spread across 27 agencies in 20 federal departments, independent agencies, and White House offices. This is the outgrowth of the 235-year history of a nation whose growth and economic vitality was intrinsically tied to navigation and maritime activities, evolving over time.

Additionally, the marine transportation system faces many challenges. Our nation's critical infrastructure is aging, so we must face the fact that funding to maintain and expand existing facilities to remain internationally competitive is in short supply. We are confronted daily by the importance of safety on our waterways, the necessity to protect life, property, and the environment, and provide for a reliable and resilient system that supports a robust export trade.

Supporting the Federal Partnership

To join with our federal partners to address these challenges, USACE is an active member of the Committee on the Marine Transportation System (CMTS).

The CMTS "National Strategy" recommends 34 actions under five priority areas, and USACE has taken a strong role in many of these interagency initiatives—particularly regarding navigation technology collaboration—including:

- A collaborative effort with the U.S. Coast Guard and waterway operators in the Gulf of Mexico region to improve preparedness in heavy weather and high water events through coordination and communication, and to reduce the threats posed by breakaway vessels to continuity of operations and critical infrastructure.
- Coordinating and improving delivery and accuracy of relevant navigation safety information. Related projects include developing a "river information system" distribution of lock real-time current velocity information via the Automated Identification System and collaborating with the National Oceanic and Atmospheric Administration to improve charting of precise channel limits and controlling depths.
- Setting common standards for the collection of water depth, tidal levels, bathymetric and topographic mapping, nautical charting, and wave action data.
- A plan to determine federal research and development priorities to address marine transportation

system challenges and improve operations. The USACE has teamed with the Transportation Research Board to sponsor the conference "Transforming the Marine Transportation System: A Vision for Research and Development," which was held June 30 and July 1, 2010.

USACE is leading an interagency team under the CMTS to respond to the president's National Ocean Policy issued in July 2010. This new CMTS task team will develop a collective perspective and plan for federal MTS engagement.

Moving Forward

The CMTS has provided a successful forum for USACE to work collaboratively with other federal agencies that have responsibility for the marine transportation system.

CMTS efforts have led to marked improvements in services the federal government is able to provide operators working America's waterways. USACE will continue to work with our CMTS partners toward implementing the goals laid out in the National Strategy for the Marine Transportation System to ensure that the U.S. MTS is a safe, secure, and globally integrated network that, in harmony with the environment, ensures a free-flowing, seamless, and reliable movement of people and commerce along its waterways, sea lanes, and intermodal connections.

About the author:

Major General William T. Grisoli is the Deputy Commanding General for Civil and Emergency Operations, United States Army Corps of Engineers. He serves as principal advisor to the Chief of Engineers and the Assistant Secretary of the Army for Civil Works, directly interfaces with members of Congress on civil works issues and programs, and is responsible for emergency response missions for civil disasters and FEMA support. General Grisoli is a 1976 graduate of the United States Military Academy and earned a master of science degree in civil engineering from the University of Illinois. He is a registered professional engineer.

For more INFORMATION:

All article statistics and further information is available at the U.S. Army Corps of Engineers Web site, www.usace.army.mil;

Transportation Research Board of the National Academies Web site, www.trb.org;

and the Committee on the Marine Transportation System Web site, www.cmts.gov.

Science, Service, and Stewardship

*Protecting our resources,
strengthening our economy.*

by DR. LARRY ROBINSON

*Assistant Secretary of Commerce for Oceans and Atmosphere
National Oceanic and Atmospheric Administration*

At the National Oceanic and Atmospheric Administration (NOAA), we endeavor to understand and predict changes in climate, weather, oceans, and coasts. We share that knowledge to protect the country's coastal and marine ecosystems and resources for future generations while we add to the nation's current economic vitality.

With regard to the marine transportation system, NOAA's scientific expertise lends itself to coastal and marine spatial planning; addressing the changing conditions in the Arctic; and strengthening the foundational observations, mapping, and infrastructure that underpin all of our nation's ocean, coastal, and Great Lakes goals.

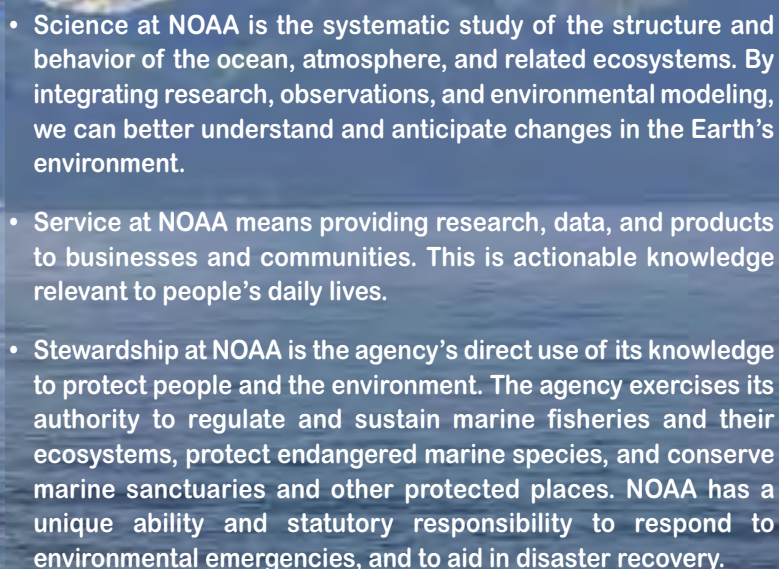
As NOAA assumes the chair of the Committee on the Marine Transportation System (CMTS) Coordinating Board for 2011, we are reminded that a safe and efficient marine transportation system is important to the U.S. for a number of vital reasons: to support our economy, to ensure national security, and to protect our ocean and coastal environments.

Information that Moves America

Commercial shippers, fishermen, recreational boaters, cruise ships, the U.S. Coast Guard and Navy, pilots, and port authorities all rely on the National Oceanic and Atmospheric Administration for navigation products and services that move America.

According to U.S. Department of Transportation and Department of Energy statistics, marine transportation is the engine of our economy, moving more than 77 percent of our overseas trade by weight, and 48 per-

cent by value in 2008. This includes nine million barrels of oil a day, or roughly 47 percent of the oil needed to meet our annual energy requirements. Further, U.S. maritime ports are also handling larger container vessels than in the past. The average size of container vessels calling at U.S. ports in 2009 was 50,000 deadweight tons (dwt), a 14 percent increase from 2004, when the average was 44,000 dwt. Maritime trade has doubled over the last 50 years, and the U.S. will see continued growth as the pace of change quickens.

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- Science at NOAA is the systematic study of the structure and behavior of the ocean, atmosphere, and related ecosystems. By integrating research, observations, and environmental modeling, we can better understand and anticipate changes in the Earth's environment.
 - Service at NOAA means providing research, data, and products to businesses and communities. This is actionable knowledge relevant to people's daily lives.
 - Stewardship at NOAA is the agency's direct use of its knowledge to protect people and the environment. The agency exercises its authority to regulate and sustain marine fisheries and their ecosystems, protect endangered marine species, and conserve marine sanctuaries and other protected places. NOAA has a unique ability and statutory responsibility to respond to environmental emergencies, and to aid in disaster recovery.

With growth comes the need to ensure safe and efficient movement on U.S. waters. NOAA's primary contributors to safe navigation are the National Weather Service and the National Ocean Service. These offices provide the essential foundation for safe navigation, including nautical charts, real-time tides and currents, accurate positioning, weather forecasts, and warnings

Satellite Aided Tracking (SARSAT) system to detect and locate mariners in distress.

The National Spatial Reference System is NOAA's and the nation's starting point for navigation services. The National Oceanic and Atmospheric Administration provides the framework for all positioning activities

in the nation through this coordinate system for latitude, longitude, height, scale, gravity, and direction. The need for very precise horizontal positioning and centimeter or better vertical positioning ranges from flood risk determination and emergency preparedness to land use and ecosystem management, in addition to mapping and transportation uses. Reliable measurements have many MTS-related applications.

For example, with real-time height measurement of under-bridge clearance or air gap, pilots can determine whether a ship will safely clear a bridge. NOAA also maps and maintains an accurate national shoreline as the essential baseline for accurate nautical charts and storm surge inundation models. Ports can use this positioning and shoreline data to determine sea-level and coastal storm vulnerability to develop new port infrastructure climate adaptation plans.

The next elements in our suite of MTS services are NOAA's tide, current, and water level products, which help shippers, cargo owners, first responders, and other MTS users make critical decisions for navigation and planning. Mariners rely on NOAA's real-time water level data, current speed and direction predictions, and meteorological data through the National Water Level Observation Network, the National Current Observation Program, and Physical Oceanographic Real-Time Systems, or PORTS®.

These systems enable vessels to route more safely. They also alert observers to tsunamis and storm surges, help emergency personnel respond to spills of hazardous materials, and guide harbor maintenance dredging. Houston-Galveston and Tampa, two PORTS® owners, report a 50 percent or greater reduc-

for MTS users. They also support emergency response, as does NOAA's Satellite and Information Service, with its operation of the Search and Rescue



NOAA produces the nation's geospatial and temporal foundation by establishing vertical heights, measuring and charting ocean depths, tracking tides and currents, and maintaining the latitude and longitude grid.

All graphics courtesy of NOAA.

tion in groundings since establishing their systems, benefiting the public through safer transportation and minimized risk to the marine environment. To enhance maritime domain awareness and reduce collisions, NOAA is also working closely with the U.S. Coast Guard to integrate PORTS® information into the Automatic Identification System, which allows ships to exchange pertinent navigation information from one another or ashore.

Positioning and water level information factor heavily into NOAA's third major product line for navigation safety—the nautical chart. The National Oceanic and Atmospheric Administration produces the nation's suite of nautical charts (paper and electronic) covering U.S. and territorial waters. Using multi-beam and side-scan sonar systems, NOAA precisely determines water depths and locates submerged dangers to navigation such as rocks or wrecks.

Responsible for surveying and charting the 3.4 million square nautical miles of U.S. Exclusive Economic Zone waters, the National Oceanic and Atmospheric Administration has worked with the U.S. Coast Guard and other stakeholders to focus on roughly 500,000 square nautical miles determined most important to navigation. Today, NOAA averages 3,000 square nautical miles of surveys a year. To maximize resources, we continually explore state and federal partnerships, as well as those with Integrated Ocean and Coastal Mapping (IOCM), to obtain more chart-quality data. IOCM leverages the efforts of a wide variety of NOAA mapping partners by coordinating data collection efforts and developing data standards. The goal is to achieve maximum benefit and efficient use of taxpayer dollars with multi-purpose mapping data for navigation and other coastal and ocean uses.

Balancing Economic Efficiency and Environmental Stewardship

Maritime commerce demands efficiency, and the National Oceanic and Atmospheric Administration is looking at new ways to maintain safety while reducing time and cost. For example, applying coastal ocean forecast modeling to traditional navigation information allows bulk cargo and container vessels to load more heavily and to time arrivals and departures more accurately. PORTS® in particular is a very useful tool—available at a relatively low cost, but with substantial benefit to the environment and the economy. Given the limited channel depths available in most U.S. ports, port operators can use PORTS® inte-

grated with other NOAA navigation data to maximize throughput and economic gain with less risk of running aground and injuring the environment or vessels.

The benefits start to add up quickly. For every additional inch of water draft available to a tanker, approximately 70,000 gallons of heating oil may be shipped. Just one extra inch of draft to a container ship can mean 9,600 more laptop computers, at a value of \$8.5 million.¹ Knowing the maximum ship draft a channel can support and the best time to sail may also reduce the cost for holding large cargo ships in port. For example, a 2007 study of the Houston-Galveston PORTS® determined \$18 million in benefits to the wider Gulf region, and a 2009 study of the Port of New York and New Jersey demonstrated \$9.9 million in benefits.²



Marine transportation system users also increasingly rely on the U.S. Integrated Ocean Observing System, or IOOS®, which is a federal, regional, and private sector partnership. NOAA is the lead federal agency that packages ocean observations and model output on coastal and lake conditions to help industry logistical planning, maximize cargo capacity, reduce incidents and shipping costs, and improve recreational boating safety at key port and coastal areas around the country. Additionally, the U.S. Coast Guard uses the IOOS® national high-frequency radar network to support search and rescue and as input for oil spill trajectories.

Putting Healthy Oceans First

Like many government agencies, the National Oceanic and Atmospheric Administration tackles

emerging challenges facing the nation. Many of these challenges are captured in the July 2010 National Ocean Policy recommendations, which we strongly support.

Addressing the changing conditions in the Arctic is one of the priority areas recommended in the ocean policy task force final report. The focus on the Arctic is needed to tackle the environmental, economic, and national security issues emerging in the region as the result of climate change and sea ice melt. CMTS agencies with Arctic responsibilities must plan carefully and act strategically to adapt existing MTS service delivery capabilities to the unique safety and environmental requirements emerging in this region. Thus, the work of the CMTS Arctic Integrated Action Team to characterize solutions to these requirements will provide valuable information.

As described in NOAA's Arctic vision and strategy, top priorities are better sea ice, better marine weather forecasts, and safe navigation. Improving geospatial infrastructure, oil spill response readiness, stewardship of living marine resources, and climate change adaption strategies are equally important if we are to realize the goal of resilient and healthy Arctic communities, economies, and ecosystems.

The National Ocean Policy also acknowledges the importance of environmental data, with its priority objective of improved observations, mapping, and infrastructure. Foundational to other priority areas of the policy, this objective fully captures the services provided by NOAA's navigation services, particularly in the context of coastal and marine spatial planning, a data-driven framework that provides transparency, predictability, and efficiency to the decision-making process for competing uses of coastal and marine resources.

NOAA's navigation services contribute the geospatial data that provide the essential foundation for coastal and marine spatial planning, ecosystem-based management, and resiliency and adaptation to climate change. Navigation services data feed the decision

support tools necessary for coastal communities, ports, and commercial interests to plan for and negotiate use of our oceans, coasts, and Great Lakes resources and to prepare for climate impacts such as sea level rise.

NOAA's work with Port Fourchon, La., is a good example of climate adaptation strategies in action. One of the most important port facilities in the nation, Port Fourchon is in the middle of a coastal wetland under severe stress from regional land subsidence, erosion, and inundation due to coastal storms. NOAA's elevation data at historical tide stations along Louisiana State Highway 1 are being used to estimate sea level rise and justify the need for elevating the highway to maintain access to the port and keep commerce moving.

The National Ocean Policy presents Committee on the Marine Transportation System member agencies with a unique opportunity, bringing together the broader federal family of departments and agencies to comprehensively manage our nation's ocean and coastal resources. Marine transportation will team with other relevant ocean uses through an improved decision-making process in regional efforts around the country. The committee can have an impact here by collaborating even more effectively to improve marine transportation system operability. NOAA stands ready to integrate its science, service, and stewardship more fully with sister CMTS agencies so that the U.S. MTS will continue to fulfill its valuable role in America's economic vitality.

About the author:

Dr. Larry Robinson is assistant secretary for conservation and management at the National Oceanic and Atmospheric Administration. Prior to this appointment Dr. Robinson served as the vice president for research at Florida A&M University. From 2007-2009, he served as science advisor to the United States Department of Agriculture's Cooperative State Research, Education, and Extension Service. He received his doctorate in nuclear chemistry from Washington University in St. Louis.

Endnotes:

¹ NOAA, 2011.

² <http://tidesandcurrents.noaa.gov>

Establishing Ballast Water Test Facilities—Success!

A “win” for the environment and the marine transportation system.

by DR. CAROLYN E. JUNEMANN

Environmental Protection Specialist

U.S. Department of Transportation Maritime Administration

The U.S. marine transportation system extends from the outer boundaries of the nation’s exclusive economic zone to the inland ports of our rivers and Great Lakes, including approximately 25,000 miles of commercially navigable channels and hundreds of deep and shallow draft ports.¹

As they carry goods and passengers, ships that transit our marine transportation system can also carry unwanted travelers—non-indigenous species, which can be transported on hulls or other surfaces and in water used for ballast. While ballast water is necessary for providing stability to a ship, it may be taken aboard in one ecosystem and discharged into another. The discharged water may contain species that are not native to the receiving water body, and, once introduced, they can displace native species, causing harm to the local ecosystem as well as disruption to the local economy.

With respect to America’s marine transportation system, however, introduction of a non-native species in one region has the potential to impact several regions through the interconnected network of waterways. Unfortunately, the very nature of this efficient waterway system makes it vulnerable to the spread of non-native species.

The Maritime Administration (MARAD), an agency within the U.S. Department of Transportation, promotes the use of waterborne transportation and its seamless integration with other segments of the transportation system. MARAD is working on promising technologies to address the environmental challenges brought about by species invasion via ballast water.

Looking for Solutions

MARAD began working on viable ballast water treatment technologies in the early 2000s, as there were no shipboard-proven technologies available to meet any reasonable treatment standard. A major roadblock was the lack of a U.S. site dedicated to full-time testing of technology. Several systems had been placed on commercial ships for efficacy testing. However, the technologies were not quite ready for shipboard tests, and installations of unproven technology created disruptions in engine rooms and had the potential for delaying voyages without a guarantee of success.

MARAD’s Ready Reserve Force vessels, 50 standby cargo ships normally in reserve awaiting use by the Department of Defense and docked at several ports around the U.S., provided a logical starting point for testing. They are pier-side for several months during the year, providing technology manufacturers with stable platforms for testing and the opportunity to learn about ship systems and their associated challenges or limitations. The agency’s in-house naval architects and marine engineers have been assisting with these efforts.



All photos courtesy of the Smithsonian Environmental Research Center.



Establishing Test Facilities

Great Ships Initiative. In 2006, MARAD personnel worked with the Northeast-Midwest Institute to design a land-based facility capable of testing promising ballast water treatment technologies in accordance with International Maritime Organization (IMO) guidelines and in fresh water. The land-based facility in Wisconsin's Port of Superior operates as the Great Ships Initiative, or GSI. Scientists from the University of Wisconsin, Superior, and the University of Minnesota, Duluth, conduct the biological tests at the facility. In 2010, MARAD received funding from the Environmental Protection Agency's Great Lakes Restoration Initiative to further its efforts in the Great Lakes. Some of those funds were used to upgrade the facility to meet United States Coast Guard certification testing requirements.

GSI has tested numerous promising treatments at the bench-scale level as well as at the land-based facility, and continues to be a leader in finding systems that can perform in fresh water. GSI personnel have also conducted efficacy testing at sea. Tests of a promising treatment system are scheduled to be conducted aboard a Great Lakes vessel in the near future.

Maritime Environmental Resource Center. In 2008, MARAD joined with the Maryland Department of Transportation and the University of Maryland's Center for Environmental Science to establish the Maritime Environmental Resource Center (MERC). Its initial focus was to evaluate the mechanical and biological efficacy, costs, and logistical aspects of ballast water treatment systems and to assess the economic impacts of ballast water regulations and management approaches.

MERC was rolled out during a shipboard ceremony in Baltimore Harbor in July 2008. Test facilities aboard two of the Maritime Administration's Ready Reserve Force ships—the *Cape Washington* and the *Cape Wrath*—were completed, and IMO compliance tests of several promising technologies have been conducted aboard the *Cape Washington*.² MERC personnel have also conducted at-sea shipboard efficacy testing of treatment systems.

To add additional flexibility, the idea of a platform capable of being towed, which could facilitate testing technologies in several different salinities, was added to the MERC effort. MARAD provided funds toward the design and modification of an existing commercial

barge to support the testing. While some testing would remain aboard the *Cape Washington*, the barge will be used as the primary platform for testing treatment technologies.

Training Ship. The *Golden Bear*, a MARAD-owned training ship used by California Maritime Academy in Vallejo, Calif., was added to round out the agency's effort. MARAD signed a cooperative agreement with the academy and provided funding to modify the ship for testing treatment technologies and to conduct USCG certification tests. As a training ship, researchers benefit from a stable and static operational platform. The *Golden Bear* provides access to an operational ship with purpose-built laboratories for researchers working on treatment solutions so that actual underway testing can be achieved as the vessel sails on its training sea voyages. It also provides an opportunity to educate the next generation of merchant mariner cadets and industry partners on ballast water issues. Technology tests conducted by personnel from the Moss Landing Marine Laboratory were performed aboard the vessel during the 2010 and 2011 summer sea terms.

The Future

The facilities will continue testing of ballast water treatment technologies to help those developing technology gain IMO approval. MARAD's efforts are designed to help these facilities attain the capability to conduct tests as part of future USCG certification processes. Before the U.S. can have a successful domestic ballast water regulatory program, we must first have facilities capable of certifying ballast water systems. This can only be accomplished by a focused effort and an experienced team of people.

A successful ballast water test facility is a "win" for the environment and the marine transportation system. The effort is a testament to what can be accomplished with the sustained cooperation and innovation of our maritime industry, other federal agencies, and academia.

About the author:

Dr. Carolyn E. Junemann has been with the Maritime Administration for 20 years. She is an environmental protection specialist in MARAD's Office of Environment and is a graduate of the State University of New York Maritime College. She received graduate degrees from the Tulane University School of Public Health and Tropical Medicine.

Endnotes:

¹ <http://www.cmts.gov/nationalstrategy.htm>

² The science team consists of personnel from University of Maryland's Center for Environmental Science and the Smithsonian Environmental Research Center.

Fair, Efficient Dispute Resolution

*The U.S. Department of Justice keeps the
marine transportation system moving.*

by MR. PETER F. FROST
*Director, Aviation and Admiralty Litigation
Torts Branch, Civil Division
U.S. Department of Justice*

The U.S. marine transportation system includes a wide range of waterways, facilities, and support activities, many of which are maintained, owned, or operated by federal agencies such as the Army Corps of Engineers (USACE), the Coast Guard, and the National Oceanic and Atmospheric Administration. All are subject to some form of federal regulation. There are occasionally disputes related to those federal components of the system, and those disputes sometimes lead to litigation. Efficient and early resolution of those disputes and of related litigation is critical to efficient operation of the marine transportation system. This is where the U.S. Department of Justice (DOJ) comes in.

As the nation's litigator, the DOJ is tasked with representing the interests of the United States in court. While there are a few agencies that have independent litigating authority, the majority of federal agencies are represented in court by the local U.S. Attorney's office. Maritime litigation is handled almost exclusively by the Admiralty section of the Torts Branch, in the Civil Division.

Torts Branch Admiralty attorneys appear in every federal district court in which a maritime matter may be brought, and in all related federal appellate courts. They defend federal agencies against claims in admiralty cases and, in certain cases such as oil spill clean-up matters, bring affirmative claims on behalf of the U.S. To handle such cases, DOJ attorneys must know more than the law; they must become experts on the subject matter of the litigation—the marine transportation system components at issue.

For example, safety at sea is a critical component of marine transport. Without it, ships could not operate. Maintenance and repair of river and harbor facilities are also essential activities, as are dredging federally maintained waterways and charting all waterways. To varying degrees, Department of Justice attorneys learn about all of these activities.

Interactions with Other Federal Agencies

Torts Branch Admiralty attorneys typically handle matters having to do with the U.S. Coast Guard, the U.S. Army Corps of Engineers, and the National Oceanic and Atmospheric Administration. Interactions with the Coast Guard include litigating any infractions of law under the Coast Guard's areas of responsibility, such as unlawful vessel discharges, seaborne drug smuggling, and sea border violations. Litigation can also clarify Coast Guard jurisdiction and authority (see sidebar).

For marine navigation purposes, the nation's rivers and harbors belong to the U.S. Army Corps of Engineers, which builds, operates, and maintains facilities and structures on our navigable waterways, including locks, dams, sea walls, and piers. Authority for maintaining these structures and keeping navigable rivers and harbors open and operating is found in the Rivers and Harbors Act.¹ This comprehensive statutory framework addresses environmental concerns, obstruction of navigable waterways, and damage to federal river and harbor facilities.

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Notable Litigations

Northern Voyager Sinking

Coast Guard search and rescue activities contribute significantly to the safety of life at sea. It is important that all mariners are certain about the Coast Guard's authority in such undertakings, but things are not always as clear as we would like. A notable case involved the loss of the fishing vessel *Northern Voyager* off the Massachusetts coast in 1997.

The 140-foot offshore trawler lost a rudder while offshore of the historic fishing town of Gloucester, Mass. This left an open hole in the ship's hull, through which seawater flowed faster than the installed pumps could handle. The captain called for the Coast Guard, who assisted immediately with portable pumps and Coast Guardsmen to operate them.

Despite all efforts, the water continued to rise and the vessel appeared lost, so the Coast Guard ordered evacuation. The vessel was evacuated and sank. The owners and insurers, however, sued the United States for the vessel's loss, alleging that the Coast Guard did not have the authority to order their vessel evacuated, and that Coast Guard efforts to save the vessel were negligent in any event.

DOJ defended the suit. After a dismissal, an appeal, a trial, and another appeal, the government prevailed, establishing clearly that the Coast Guard's efforts were not negligent and that the Coast Guard does have the authority to direct such an evacuation during an emergency at sea. While vindication of the efforts of the individual Coast Guardsmen was important, a longer-lasting impact of DOJ's efforts was a clear ruling on the Coast Guard's authority to direct events during an emergency at sea.

B&H Towing

In 2005, a towboat pushing 12 loaded barges on the Ohio River lost control of the tow while exiting the lock chamber of the Belleville Dam. The tow stalled in the current, causing the barges to strike the upstream end of the lock's long wall and break up the tow. Several barges then drifted down in the dam, effectively jamming the dam in the open position.

With the gates jammed open, USACE could not moderate the river's flow, and the navigational pool elevation dropped below acceptable limits for commercial navigation. As a result, the river was closed to barge traffic for a period of time.

While this obviously adversely affected the marine transportation system in the area, it also was claimed to have

caused substantial subsidence in riverside properties, such that land was lost and values deteriorated. The resulting litigation involved more than 170 riverside landowners, as well as commercial users of the waterway, the United States, and the State of Ohio.

Justice Department attorneys represented USACE interests and succeeded in settling the matter with little ultimate financial impact on the United States.

RMS Queen Elizabeth II

In 1992, the *QE2* called at Martha's Vineyard and departed by way of Vineyard Sound, bound for New York.

The ship's pilot planned to take her on roughly the same path he followed for numerous other vessels. Unfortunately, none of those other vessels drew much more than 12 feet. The *QE2* drew more than 25 feet. As the ship crossed near a charted sounding of 32 feet, it struck a rocky pinnacle at a shallower depth.

The damage was substantial, and the claims were enhanced by the ship's having to cancel 15 voyages, for a total damages claim exceeding \$55 million. At trial the court found the chart was not inaccurate; there was a 32-foot depth at exactly the point indicated on the chart. There also happened to be shallower depths nearby, which had not been identified by properly conducted lead line surveys.¹

It was undisputed that the waterway was not federally maintained, and in fact was not dredged at all. While there were numerous factors that lead to the court exonerating the U.S. chart makers, we note here only that the United States prevailed at trial and the verdict was upheld on appeal.

Endnote:

¹ The difficulty of the surveying and charting tasks bears some explanation. While surveying technology has advanced rapidly and dramatically in the past couple of decades, up until roughly 1930 surveys were performed chiefly by lead line soundings. Even with multiple legs run in every survey, vast swaths of the ocean bottom (the areas between lines of sounding) were effectively missed.

While it may be expected that adjacent depths in a given survey would tend to be similar, there is no guarantee. In reality it is entirely possible that a 10-foot depth exists as essentially a pinnacle immediately adjacent to a 40-foot depth, and a lead line sounding conducted in accordance with best surveying practices could quite easily miss that anomaly.

While surveys today are almost universally conducted using sonar or—better yet—side-scan sonar, the vast area that requires survey and the limited assets available to perform those surveys guarantee that much of the nation's waterways were last surveyed and charted decades ago, using lead line soundings or equivalent technology. This, in turn, almost guarantees that surveying anomalies such as the pinnacle described above exist, and that ships may well find them the hard way.

Indeed, part of the act is the oldest federal environmental protection statute in existence, having been enacted in 1899. Sometimes referred to as the Refuse Act, this portion of the Rivers and Harbors Act prohibits the discharge of trash and refuse on navigable waterways. For our purposes here, however, litigation frequently handled by the Department of Justice involves 33 U.S.C. § 409, known colloquially as the "Wreck Act," and cost recovery actions stemming from damage to river and harbor structures.

The Wreck Act prohibits obstruction of navigable waterways by anchored, moored, or sunken vessels. When a vessel is sunk in a navigable channel, the owner must immediately mark it with a buoy during the day and a light at night until it is removed. If the owner does not remove it, the U.S. may do so and bill the owner for the removal costs. It is common for federal removal actions to result in litigation, and for DOJ attorneys to pursue the cost recovery. Some very significant removal actions resulted from Hurricane Katrina that are still being litigated.

Similarly, vessel allisions with wharves, dams, and lock structures sometimes damage those structures. In the case of locks and dams, the damage can render them inoperable and shut a waterway down. The Rivers and Harbors Act provides authority for USACE to recover the costs of reopening a waterway in such circumstances and/or repairing damage to those facilities. While USACE and its customers usually can resolve such cost issues without formal legal action, if that process does not succeed, cost-recovery litigation will be handled by the Department of Justice.

Another aspect of maintaining waterways is monitoring rivers and harbors for siltation and, if dredging is indicated, exercising the discretion to best utilize the nation's dredging resources to dredge federally maintained waterways. The U.S. Army Corps of Engineers manages those surveying and dredging efforts. The National Oceanic and Atmospheric Administration (NOAA) aids these efforts.

Of its wide range of responsibilities, one that is very significant for the marine transportation system is ocean surveying and charting. NOAA's Office of Coast Survey is responsible for surveying and charting more than 10,000 square miles of United States waters.

Despite best efforts, however, vessels still occasionally ground in federally maintained waterways, and occasionally allege that the grounding was due to surveying, dredging, or chart errors. When grounding damages a vessel or closes a waterway, litigation is almost sure to result, and the Justice Department will be involved.

Marine Oil Spills

When a marine oil spill occurs, Department of Justice lawyers bring affirmative claims to recover removal costs and damages under the Oil Pollution Act (OPA).² These efforts implement the broader policy purposes of OPA, which include ensuring spills are cleaned up and allowing tank vessels to operate safely in U.S. waters.

The extended federal family will usually be involved, to varying degrees, to ensure any spill is cleaned up as quickly as possible and, to the extent the spill impacts marine commerce, to ensure those impacts are mitigated as much as possible. DOJ attorneys are normally part of such efforts from their inception.

The most significant examples of those suits involved the grounding of the *Exxon Valdez* and the explosion and loss of the mobile rig *Deepwater Horizon*. In each of those cases, attorneys from DOJ's Admiralty Section and Environment and Natural Resources Division worked hand-in-hand to recover clean-up costs, natural resource damages, and a raft of related damages allowed under OPA. Needless to say, the *Deepwater Horizon* litigation has barely begun, but teams of Justice attorneys are working to ensure federal interests are vindicated and taxpayer money spent on this disaster is recovered.

In Summation

Virtually every aspect of marine transportation can lead to litigation. When the parties involved are agencies of the United States, attorneys at the Department of Justice handle the claims and defenses. In working to fairly and efficiently resolve disputes involving components of the marine transportation system, the DOJ is involved in every aspect of the system.

About the author:

Mr. Frost is director of the Aviation and Admiralty Litigation Section at the Department of Justice. Prior to his career at the Justice Department Mr. Frost was a naval officer, serving as a line officer on ships at sea and, after law school, in military courts.

Endnotes:

¹ 33 U.S.C. §§ 401 - 467.

² 33 U.S.C. §§ 2701 - 2717.



U.S. Department of State

Supporting the Arctic marine transportation system.

by LCDR JON TRENT WARNER

Bureau of Oceans and International Environmental and Scientific Affairs

Office of Ocean and Polar Affairs

U.S. Department of State

In relation to the marine transportation system (MTS), the U.S. is preparing to address a host of issues likely to arise from any increases in shipping into, out of, and through the Arctic. A top priority will be to facilitate shipping that is safe, secure, and environmentally sound.

The U.S. Department of State may not be the first department to come to mind when listing the parts of the federal government that affect the U.S. domestic marine transportation system. Nevertheless, it plays an important role on the international stage in shaping the foreign policies that can directly impact the domestic marine transportation system. Nowhere is this truer than in the Arctic.

In recent years, climate change has focused the world's attention on the Arctic due in large part to the rapid retreat of Arctic sea ice. As the prospect increases that more of the Arctic Ocean will be free of ice during the summer, so too does the likelihood that the Arctic will see an increase in shipping. An increase in Arctic shipping brings the possibility of an increase in marine casualties, placing the safety of life at sea and the Arctic marine environment at greater risk.

Fortunately, no major loss of life at sea has occurred in the Arctic recently, and shipborne pollution incidents in the Arctic region have been few since the T/V *Exxon Valdez* spill. However, more recent events such as the sinking of the M/S *Explorer* in November 2007 in Antarctic waters¹ and the *Deepwater Horizon* oil spill in the Gulf of Mexico

in 2010, although not occurring in the Arctic, have underscored the serious potential and very real nature of the dangers of such events to human life and the environment.

Accordingly, the international community has taken proactive steps in various international forums to develop understanding and policies to address these risks. The State Department, working mainly through the Office of Ocean and Polar Affairs, coordinates and/or leads U.S. government efforts in the Arctic Council and its six working groups; and the International Maritime Organization (IMO) and its various committees and sub-committees to help protect and promote U.S. interests regarding initiatives affecting the Arctic.²

Arctic Council

The Arctic Council is a high-level forum for its eight member states—Canada, Denmark, Finland, Iceland,

Norway, Russian Federation, Sweden, and the United States—to address common interests in the Arctic. For instance, in response to the climatic changes in the Arctic and its accompanying issues, the Arctic Council's Protection of the Arctic Marine Environment working group completed the Arctic Marine Shipping Assessment (AMSA) 2009 report.



Among its findings: Except in limited areas of the Arctic, there is a lack of emergency response capacity for saving lives and for pollution mitigation. In addition, AMSA found that the most significant threat from ships to the Arctic marine environment is the release of oil through accidental or illegal discharge, and that there are no uniform international standards for ice navigators or for Arctic safety and survival for seafarers in polar conditions. There are also no specifically tailored mandatory environmental standards developed by IMO for vessels operating in Arctic waters.

Accordingly, the AMSA authors made recommendations to address these shortfalls, including calling on the Arctic states to support the development and implementation of a multinational Arctic search and rescue (SAR) instrument, that Arctic states decide to enhance their mutual cooperation in the field of oil spill prevention, and that the Arctic states support efforts at the IMO to update and make mandatory relevant parts of the guidelines for ships operating in Arctic ice-covered waters.

Arctic Search and Rescue

In the summer of 2009, the State Department began coordinating the work of the Arctic Council member states to implement a U.S. priority from the Arctic Council's 2009 Tromsø Declaration, in which foreign ministers called for establishment of a task force to develop a search and rescue (SAR) agreement for the Arctic.³ In December 2009, the United States hosted the first meeting of the Arctic SAR task force in Washington, D.C., co-chairing the force with the Russian Federation, during which representatives of all eight Arctic Council member states participated.

Four subsequent rounds of discussions were held in other Arctic member states to complete the negotiations, and the Arctic SAR task force worked to finalize the SAR agreement in time to be presented for adoption by the Arctic Council at its ministerial meeting in the spring of 2011.

As of the time this article was written, it was anticipated that the Arctic Council member states would sign an Arctic SAR agreement to include delineated legal responsibility for aeronautical and maritime search and rescue in the Arctic without prejudice to the delimitation of national boundaries. Fulfilling the AMSA recommendation, this instrument will be the basis for future improved search and rescue coordination and cooperation in the Arctic. Its fruition will provide a regional overarching cooperative arrange-

ment for search and rescue that will support other bilateral SAR agreements already in force among Arctic nations, and will help fill a critical gap in the U.S. Arctic MTS for emergency response capacity.

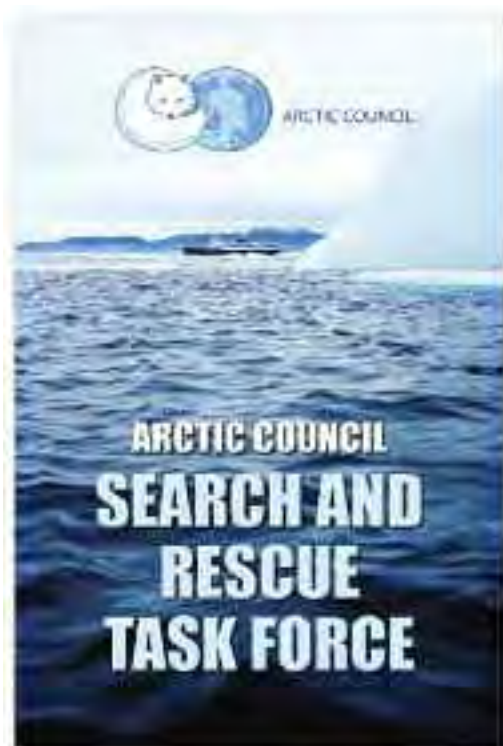
Oil Spill Response

As AMSA and the Report of the President from the National Commission on the BP *Deepwater Horizon* Oil Spill and Offshore Drilling make clear, there is an overall lack of emergency response capacity in the Arctic. Although various Arctic Council working groups have developed various guidelines addressing the management of oil and gas activities in the Arctic,⁴ as yet there is no emergency coordination arrangement for pollution response specific to the Arctic.

Additionally, while the International Convention on Oil Pollution Preparedness, Response, and Cooperation is a framework for international cooperation to combat marine pollution, it promotes bilateral and multilateral agreements for oil pollution and preparedness on a more regional basis.

Recently the department hosted a briefing by the National Response Team vice chair and executive director concerning the National Response System and the role of the department in that system. The discussion centered on lessons learned from the *Deepwater Horizon* oil spill, including a mandate for strengthening oil spill response, planning, and capacity. The mandate includes a review of national response structures and communication protocols, both of which implicate the department's role in the conduct of U.S. foreign relations.

Initial efforts are underway to facilitate closer coordination for emergency pollution response among states in the Arctic region. These efforts could lead to better coordination arrangements for pollution mitigation in





The International Maritime Organization is responsible for the and safety and security of shipping and the prevention of marine pollution by ships.

the Arctic, thus helping to fill an important infrastructure gap in the MTS.

IMO Polar Code

Unlike the Arctic Council, the International Maritime Organization holds the power to develop and adopt international standards for shipping. Although IMO's work includes efforts that broadly affect the Arctic, perhaps its main work to improve the safety of life at sea and the protection of the environment in the Arctic is its polar code for ships, which is currently in development.

Its goal: To consolidate IMO standards relevant to the operation of vessels in polar waters (Arctic and Antarctic), including but not limited to ship operations, design, manning, and measures for environmental protection.

Framers have agreed that the code should be risk-based, with functional requirements supported by prescriptive provisions as needed, that the code would contain both mandatory and recommendatory components, that requirements for the Arctic and the Antarctic may differ as required, and that the code should be made mandatory via existing IMO instruments.

As of the drafting of this article, the IMO Subcommittee on Ship Design and Equipment had developed three main components: a matrix reflecting the safety

and environmental hazards that are unique to polar areas, an overview of the functional requirements of ships operating in polar waters, and a draft of the mandatory part of the code.

A safe and environmentally secure Arctic is an important U.S. goal, and the State Department works to advance these interests abroad and meet this goal by coordinating the collective efforts of the international community through the Arctic Council and the IMO. Efforts to improve the international response to save lives and to prevent and mitigate pollution discharges in the Arctic directly advance U.S. interest, and have the incidental effect of filling existing gaps in the U.S. MTS infrastructure.

About the author:

LCDR Warner is a Coast Guard judge advocate detailed to the U.S. State Department from July 2009 to June 2011. He is a member of the Utah State Bar and a graduate of Gonzaga University School of Law. While earning a bachelor's degree in Russian from the University of Utah, he served a 15-month tour as a Fawcett Fellow at the U.S. Embassy in Sofia, Bulgaria, serving as a consular associate.

Endnotes:

¹ The MS *Explorer* capsized after striking an iceberg. The passengers spent several hours in lifeboats in sub-zero temperatures. <http://www.abc.net.au/news/stories/2007/11/26/2101781.htm>

² One way the department helps coordinate U.S. efforts related to international shipping on the international stage is through the Shipping Coordinating Committee. "This federal advisory committee was established to provide a forum for interested members of the public—private citizens, members of the maritime shipping industry, non-governmental organizations, small businesses, environmental organizations, and labor groups—to participate in discussions about shipping initiatives to be considered by the International Maritime Organization. The U.S. government, through the Shipping Coordinating Committee, solicits the views of interested members of the public on a wide range of technical issues connected with international shipping safety, security, and environmental protection. The committee and its subcommittees consider numerous IMO initiatives, generally convening prior to meetings of the IMO assembly and other international meetings as necessary to discuss and make recommendations to the Secretary of State to guide the U.S. delegations. The chairperson or U.S. government employee designated as the "head of delegation" to the IMO committees or subcommittees with jurisdiction over the agenda items (usually an officer or official of the U.S. Coast Guard) presides over these meetings. Although created before the passage of the Federal Advisory Committee Act (FACA), the Shipping Coordinating Committee is now governed by the requirements of FACA. Accordingly, notice of meetings held by the Shipping Coordinating Committee are published in the *Federal Register*. Meetings of subcommittees and any related working groups of the Shipping Coordinating Committee are similarly announced." See U.S. Coast Guard *Proceedings of the Marine Safety & Security Council*, p. 19, Summer 2009.

³ Tromsø Declaration on the Occasion of the Sixth Ministerial Meeting of the Arctic Council, Tromsø Norway, April 29, 2009. <http://www.state.gov/g/oes/rls/other/2009/123483.htm>

⁴ E.g. Offshore Oil and Gas Guidelines 2009, Guidelines for Transfer of Refined Oil and Oil Products in Arctic Waters, and Field Guide for Oil Spill Response in Arctic Waters, 1998.

Marine Transportation System Statistical Knowledge

Enhanced through collaboration and research.

by MR. MATTHEW CHAMBERS
Senior Transportation Specialist
Research and Innovative Technology Administration
Bureau of Transportation Statistics
U.S. Department of Transportation

Other Federal
Agency Roles

The Bureau of Transportation Statistics (BTS) of the Research and Innovative Technology Administration in the U.S. Department of Transportation collects, manages, and disseminates transportation data, information, and statistical knowledge. Through its maritime program, BTS works to close data gaps and improve statistics in the areas of coastal, ocean, and inland water transportation, including collecting ferry data through the National Census of Ferry Operators and collaborating with federal agencies that are active in ocean and coastal activities through the Maritime Data Working Group. BTS also disseminates statistical knowledge on the marine transportation system through a wide range of data products and publications such as “America’s Container Ports: Freight Hubs That Connect Our Nation to Global Markets.”

In addition to maritime data, BTS collects, produces, and disseminates modal and intermodal data and performance measures for:

- commercial aviation and the airline industry,
- the entire U.S. transportation system,
- delays and wait times at border crossings,
- domestic and international freight and passenger flow,
- cargo container and passenger count through ports of entry,
- surface trade with Canada and Mexico,
- levels of connectivity among transportation modes.

Bureau of Transportation Statistics data products are also used by a growing number of customers and key

stakeholders beyond the general public, including federal, state, and local government agencies; academia; private industry; and transportation professionals.

Creating Marine Transportation System Data

Since 2006, BTS has administered a biennial National Census of Ferry Operators, which gathers data on ferry operators, routes, terminals, and vessels. BTS makes the ferry census results, combined with vessel data provided by the U.S. Army Corps of Engineers and U.S. Coast Guard, available through its website. The 2008 survey found that ferries carried 106 million passengers annually through nearly 500 terminals in 37 states and three U.S. territories. Operators provided service on nearly 350 different route segments, covering 6,844 nautical miles, with almost 700 active vessels.

Every two years the bureau modifies the ferry census to improve data quality and capture new data elements needed by census users. BTS also includes ferry terminals in its Intermodal Passenger Connectivity Database, which shows the availability of ferry connections with other scheduled modes of transit and intercity transportation. This data shows that about 40 percent of U.S. passenger ferry terminals offer connections to other public transportation modes.¹

Sharing Information

To facilitate information exchange, the BTS marine program sponsors and leads meetings of the Maritime



Data Working Group and hosts and maintains the group's Web site at www.bts.gov. Online information includes a list of the group's joint publications, links to members' Web sites, the group mission statement, and a complete list of members.

The working group also produces the interagency "Maritime Trade and Transportation" series of reports that present major trends in the commercial water transportation industry, which provides freight and passenger travel services in domestic and international markets as well as port and cargo-handling services.

The BTS maritime program also provides maritime-related data and analysis in support of the U.S. Department of Transportation and interagency groups such as the Committee on the Marine Transportation System, the Federal Initiative for Navigation Data Enhancement/Navigation Data Integration, and the Marine Board of the National Academies. The BTS staff offers subject matter expertise, reviews interagency reports and plans for accuracy, and presents and shares the latest BTS data products and publications at interagency meetings.

Managing Marine Transportation System Knowledge

The Research and Innovative Technology Administration and its Bureau of Transportation Statistics leads and supports cooperative and interagency maritime research and development efforts. For example, the Research and Innovative Technology Administration, the Maritime Administration, and the U.S. Navy are jointly sponsoring non-mobile hydrogen power facility research.

In addition, administrator Peter H. Appel of the Research and Innovative Technology Administration served as the keynote speaker at the conference "Transforming the Marine Transportation System: a Vision for Research and Development."

Transportation data and analysis produced by BTS helps government agencies and industry leaders make informed decisions. For example, the bureau provides these entities with publications such as the congressionally mandated *Transportation Statistics Annual Report* and its online companion, the *National Transportation Statistics* publication. These reports present maritime data and analysis along with that of other transportation modes, allowing readers to compare and contrast modal activity.

To provide timely information to our customers, BTS compiled and published a "Gulf Coast Ports Surrounding the *Deepwater Horizon* Oil Spill" fact sheet in June 2010. This fact sheet, the first of a new BTS quick-response product line, presents data analysis on New Orleans, La., and Mobile, Ala., two of the nation's major seaports close to the *Deepwater Horizon* mobile offshore drilling unit explosion and oil spill.

Marine Transportation System Findings

BTS publishes a variety of timely and relevant data products for a host of customers and key stakeholders, including comprehensive reports covering the entire marine transportation system.

For example, the report "America's Container Ports: Freight Hubs That Connect Our Nation to Global Markets" provides an overview of the movement of maritime freight handled by the nation's container seaports and trends in maritime freight movement. One indicator: The recent U.S. and global economic downturn resulted in a decline in U.S. port container traffic.

"Atlantic Coast U.S. Seaports" highlights the major Atlantic container ports of New York; New Jersey; Virginia; Savannah, Ga.; and Charleston, S.C. These ports as well as others are preparing for an expected increase in cargo generated by larger vessels navigating an expanded Panama Canal.²

About the author:

Mr. Matthew Chambers, a BTS senior transportation specialist, has worked in federal service for the past 11 years. He currently manages the BTS maritime program, for which he received an award for excellence in a support function. He also serves as the project manager for the Transportation Statistics Annual Report. He previously worked as an economist with the Federal Maritime Commission.

Endnotes:

¹ Bruce Goldberg, "Making Connections: Intermodal Links Between Scheduled Passenger Ferries and Other Public Transportation Modes," Washington, DC: February 2009.

² The Panama Canal Authority expects its expansion to be completed in 2014.

For more INFORMATION:

For the latest maritime-related Bureau of Transportation Statistics data products and publications, visit the Web site at:

www.bts.gov/programs/maritime_program

Lessons Learned

from **USCG Casualty
Investigations**



Na Hoku II / Kiele V



M/V Mr. Fred



M/V Bright Field

***A regular feature in Proceedings:
“Lessons Learned From USCG
Casualty Investigations.”***

In this ongoing feature, we take a close look at recent marine casualties. We explore how these incidents occurred, including any environmental, vessel design, or human error factors that contributed to each event.

We outline the U.S. Coast Guard marine casualty investigations that followed, describe in detail the lessons learned through them, and indicate any changes in maritime regulations that occurred as a result of those investigations.

Unless otherwise noted, all information, statistics, graphics, and quotes come from the investigative report. All conclusions are based on information taken from the report.

Lessons Learned

from **USCG Casualty Investigations**

Catamaran Catastrophes

Two die in tragic dismastings.

by Ms. CAROLYN STEELE
Technical Writer

Two separate dismastings involving commercial sightseeing catamarans in Hawaii turned exhilarating vacation experiences into shocking and traumatic tragedies, as each resulted in one passenger being killed and several others injured.

Occurring within four months of each other, the incidents prompted the Coast Guard to initiate a comprehensive state-wide safety compliance check of all commercial sailing vessels certified to carry passengers in Hawaiian waters. The investigations into the causes of the mast failures also led the Coast Guard to make significant recommendations to prevent this type of incident.

The two events involved the *Na Hoku II* (catamaran 1) on December 1, 2006, and the *Kiele V* (catamaran 2) on March 25, 2007. In the case of catamaran 2, the vessel swamped and eventually sank. Both catamarans were filled with sightseeing passengers returning from afternoon excursions. The wind and weather conditions were similar in both cases—sunny with gusty winds of 20–25 knots, and swells between three and five feet.

Though both vessels had a history of problems, each had passed recent inspections, so their certificates of inspection (COIs) were valid at the time of their respective dismastings. This fact and the subsequent Coast Guard investigations led to two main conclusions:

- National standards for masting and rigging need to be developed (at the time of the casualties there were none).

- Training of inspectors needs to be improved so that inspectors can recognize if sailing equipment is in good condition and the mast and rigging sail plan meet minimum design and construction standards.

Each catamaran had its own history and set of circumstances that led to these sudden and unforeseen dismastings. The incidents were thoroughly investigated, but a few questions remained unanswered because some evidence was lost at sea.

FIRST CATASTROPHE

It was a classically beautiful tropical afternoon in Hawaii. The vessel carried its passengers swiftly through the blue-green waters, the winds were brisk, and the late afternoon sun gave the sea a silvery patina.

How could this voyage end so brutally, with one person dead and several others wounded?

Timeline

On December 1, 2006, at 3:30 p.m., the 45-foot-long sailing catamaran departed Waikiki Beach with 23 passengers and three crew for its third round-trip sightseeing tour of Mamala Bay in Oahu, Hawaii.

At 4:29 p.m., the captain saw ripples in the water headed toward the vessel, so he changed course, falling off to port in an attempt to moderate the effects of the wind. From the helm, which was at the stern of the vessel, the captain heard a whooshing sound as the sail rapidly filled with wind. He felt the vessel take on speed and noticed the lower portion of the mainsail furling rigging begin to pump in an ominous side-to-

side motion. He tried to release the strain on the main-sail by slacking the port sheet.

Then he heard a loud pop.

The Dismasting

The mast abruptly buckled in three places, falling aft and to the port side of the vessel. The lowest buckle occurred three feet above the mast step, the midsection buckled 10 feet above the mast step, and the top section buckled 36 feet above the mast step.

The portion of the mast between the two lower buckles fell on the stern of the boat, striking a 13-year-old boy who was sitting near his parents. It landed on top of the cabin, on the port side of the centerline, and angled toward the vessel's aft port side. The portion of the mast between the midsection buckle and the top section buckle remained vertical while the remainder of the mast bent toward the stern of the vessel, approximately 45 degrees to its midsection, and came to rest with the mast tip in the water, creating two sides of a triangle with an apex approximately 40 feet in the air.

The heavy, crumpled mast pinned the boy face-down to the top of the cabin. It also struck a second passenger—the boy's mother—fracturing her foot and pelvis. A third passenger standing at the port side of the vessel's bow was struck on the head and knocked unconscious by falling rigging. A fourth passenger was struck on the back by stays and shrouds and suffered lacerations to her right shoulder and hand.

Rescue and Recovery

At 4:30 p.m., the captain notified Coast Guard Sector Honolulu Command Center (SCC) via a mayday call on VHF channel 16, informing them that the vessel's mast had broken and trapped a passenger. He started the starboard engine and headed west toward Waikiki Beach. SCC directed Station Honolulu to respond to the incident.

The crewmembers and several passengers fought unsuccessfully to free the trapped boy. One of the passengers checked the boy's vital signs, but could not find a pulse.

Within three minutes of the call from SCC, a 47-foot Coast Guard motor lifeboat arrived on the scene. Coast Guard personnel boarded the sailing vessel and struggled to lift the mast off the boy, but were unable to do so. They requested a medevac helicopter and lifting equipment.

At 4:50 p.m., the motor lifeboat took the sailing vessel in tow alongside, and the Honolulu Fire Department arrived. Both fire department and Coast Guard personnel worked to lift the mast with airbags.

At 5:11 p.m., they at last raised the mast, freeing the boy. Emergency medical technicians administered cardiopulmonary resuscitation (CPR), and a Honolulu Fire Department helicopter airlifted him from the vessel to a local hospital. Doctors there were unable to revive him. The Honolulu medical examiner's report later stated that the boy died as "a result of blunt force injuries of the head and neck sustained when he was hit by a falling mast on a catamaran."

At 5:20 p.m., emergency personnel requested a second medevac helicopter for the passenger with head injuries. Half an hour later, the sailing vessel tied up at Ala Wai fuel dock, and the three remaining injured passengers were transported to a nearby hospital.

SECOND CATASTROPHE

Timeline

Four months later, on March 25, 2007, passengers were enjoying a whale-watching cruise on another sailing catamaran. The sightseeing trip, which took passengers to the west side of the island of Maui, was scheduled to last from 3:30 to 5:30 in the afternoon. The 50-foot-long vessel held 47 passengers, four crewmembers, and a whale naturalist. At about 4:50 p.m., the captain maneuvered the vessel down a swell on a port tack that would take the vessel back to shore. With winds coming from behind, the catamaran was making approximately 10.5 knots. It was another picture-perfect tropical afternoon.

At approximately 10 to 15 minutes into the return leg of the trip, the vessel experienced a sudden, catastrophic collapse of the mast, trapping a 48-year-old man under the fallen rigging and injuring two other passengers.

At 5:09 p.m., the Coast Guard received the initial distress call from the captain of the vessel via channel 16 VHF. At the same time, one of the crewmembers called 911 on a cell phone and informed the dispatcher of the dismasting and the vessel's approximate location. The crew mustered all the passengers to make sure nobody had been knocked overboard. After everyone was accounted for, the passengers were moved inside the enclosed cabin and told to don life jackets and remain calm. At the same time, two deckhands forward of the enclosed cabin were unsuccessfully trying to free the

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Vessel History

After the deadly accident in December 2006, investigators discovered the owner had made numerous unauthorized changes to the vessel. The vessel's inspection history of 2000–2006 revealed gaps in documentation and repeated failures to spot rigging problems.

Missed Opportunities

In June of 2000, Coast Guard inspectors had examined the vessel's hull in drydock. The CG 840 workbook at this time contained a receipt for "Shorten Rigging" and an entry stating, "Replaced sails this drydock," but had no other comments about the vessel's rigging.

The investigation revealed that the Coast Guard inspector who conducted inspections on the vessel in the summer of 2000 had attended a course in sail vessel rigging around the same time. When interviewed, the inspector recalled he had some concerns about the vessel's chain plates and hull repair, but did not remember any changes to the rigging. The inspector said it was common practice to conduct a sail plan review before going out on an inspection, and that the sails had probably been removed from the vessel because the vessel was in drydock.

Nevertheless, based on what the owner later told investigators and his March 2000 receipts for a roller furler system and related equipment, it was at this time that he most likely made unauthorized modifications to the vessel's rigging.

The Coast Guard conducted re-inspections in 2001, 2002, and 2004. A damage inspection was also completed in November 2002 after a collision with another vessel. On this occasion, inspectors required the vessel to "have sail rigging inspected, especially the starboard backstay," although there is no documentation of how this was resolved. Records from the 2004 drydock inspection include a requirement to "survey all rigging and replace forestay."

In 2005, the catamaran's COI expired, but the owner continued to operate it as a small passenger vessel for eight months, in violation of 46 U.S.C. 33 11 and Coast Guard regulations. When Coast Guard marine inspectors discovered this, they issued a Notice of Violation to the owner, resulting in a civil penalty of \$1,300.00.

As part of the COI inspection in April 2006, the Coast Guard inspectors required the owner to submit a survey to attest that the mast, rigging, and related equipment were in satisfactory condition. Significantly, the rigging manager who performed the survey was the same person who had installed the modified furling system in 2000. The surveyor's April 2006 rigging report found "... no obvious problems. The cable was clean and smooth and the terminals and turnbuckles appeared to be in good shape."

The report contained no details about how the survey was conducted or how the surveyor came to these conclusions.

The April 2006 COI inspection revealed that the owner had violated the vessel's mandatory drug and alcohol program several times, and found 18 other deficiencies (none related to the rigging), which the owner corrected. The vessel was issued a temporary COI in May 2006, and was operating under this at the time of the accident in December.

Contributing Factors

Coast Guard investigators found that the following factors most likely caused the collapse of the mast. All were unapproved modifications the owner had made to the vessel, most likely in 2000.

- **Replacement of the mainsail with a jib furling system.** This jib furling system likely altered the compression loading on the mast, which in turn increased the risk of a buckling failure. Normally, the mainsail maintains an even load along the length of the mast because the luff of the mainsail is attached via a groove or track that runs the entire height of the mast. This more or less evenly distributes the dynamic forces of the wind along the mast.

In the case of this vessel, however, the owner had attached the top of the jib furler to the top of the mast, and the bottom of the jib furler to the lower section of the mast (roughly where the boom attached to the mast before it was removed). This change concentrated the dynamic forces at the top and bottom rather than uniformly along the mast, and increased the likelihood of significant twisting forces on the mast when the vessel was under sail.

The owner installed an adjustable bar, with one end secured to the furler's bottom bracket and the other end attached to the deck of the vessel, possibly to compensate for these twisting forces. But post-accident examination revealed rust and corrosion cracks on the fittings attaching this bar to the deck, and it was clear that the bar had not been tightened or adjusted for a long time.

- **Eight shrouds added to the rigging.** When the owner installed the jib furling system, he also installed additional standing rigging, apparently to compensate for the uneven distribution of the compressive load of the sail along the entire height of the mast. The owner added eight 3/8-inch stainless steel shrouds that were not in the original rigging plan. These eight extra shrouds may have introduced several thousand pounds of static compression forces on the mast.

- **Reduced mast size.** Removal of the vessel's boom further reduced the distribution of compressive forces and concentrated the load on a mast that was already undersized for its intended use. Post-casualty analysis determined that as built, the mast had a traverse buckling factor of safety of approximately 1.75. This safety factor is a measure of the mast's ability to resist buckling under side-to-side compressive forces.

By reverse-engineering the equations for traverse mast strength, the Marine Safety Center determined the mast required a minimum factor of safety of 3.38. After taking into account such variables as the installation of the main roller furler system and the holes drilled into the mast, the mast was estimated to be 50 percent undersized.¹

- **Other mast modifications.** The owner explained to investigators that he relocated winches to the mast to present a more “nautical appearance.” The owner had also attached an EPIRB mount to the mast. To do this, he had numerous holes drilled in the mast and two brackets mounted at the midpoint of the unsupported span in the mast.

Investigators noted that these holes in the side of the mast, coupled with some corrosion, degraded the cross-sectional properties of the mast by reducing its transverse moment of inertia, increasing the likelihood of a buckling failure. According to the “Principles of Yacht Design,”² the middle 70 percent of the unsupported span of a mast should not be drilled because it is most vulnerable to buckling failure.

The National Transportation Safety Board’s metallurgical report dated May 16, 2007 found that the mast contained numerous threaded holes, several corroded, with no evidence of general corrosion on exterior surfaces of the mast. Several of the holes were filled with threaded fasteners, and some with hardened organic material; others were left open. Investigators also discovered spotty pitting corrosion on the interior surfaces.

Coast Guard Conclusions

The collapse of the mast and rigging that killed and injured passengers aboard catamaran 1 occurred because the mast was undersized and the rigging was improperly configured. Although investigators did not know the exact sequence of events, the twisting or movement of the mast under extreme compressive loads likely caused it to buckle.

The owner had repeatedly failed to submit mast and rigging alterations to the Coast Guard for review and approval; 46 CFR 176.700(a) requires that “repairs or alterations to the hull, machinery, or equipment that affect the safety of the vessel must not be made without the approval of the cognizant OCMI, except during an emergency.”

The owner also failed to submit a proposed sail plan to the Marine Safety Center (MSC) with the change in sail configuration. That notwithstanding, it appears that Coast Guard inspectors repeatedly missed opportunities to identify the unapproved alterations during the annual inspections.

Endnotes:

¹ The Marine Safety Center was not able to determine the exact compression loads on the mast and rigging that caused it to buckle during the actual incident. The conclusion the mast was undersized is an estimate based on the structural properties of the mast and the stability properties of the vessel as reflected in original design plans.

² Lars Larsson and Rolf Eliasson, *International Marine*/McGraw Hill (3rd edition, 2007).

passenger from the rigging that had trapped him up against the superstructure on the starboard side of the vessel. The man was unresponsive and had no pulse.

The captain then went forward and cut the wire rope shrouds with a hacksaw to free the mast and rigging from the vessel. Once the forward rigging was cut and removed, members of the crew lowered the lifeless man to the deck, placing him forward of the cabin. One of the passengers, a nurse, administered first aid and CPR. The captain also began cutting away the aft stays to free the vessel of the mast and the mainsail, which were submerged and had begun to pull the stern of the vessel under water.

Rescue and Recovery

At 5:38 p.m., Coast Guard Station Maui received notification that the damaged catamaran was taking on water through a hole in the starboard engine room. The hole, about 10 inches in diameter, was likely caused by the mast or one of the mast spreaders after the dismasting. For several minutes one of the crewmembers tried to dewater the starboard engine room with a manual pump, but was instructed to give up that futile effort and instead remove the life floats from the cabin top.

Two other commercial passenger catamarans operating nearby arrived on the scene approximately 15 minutes after receiving the disabled vessel’s distress call. The captain decided to transfer the passengers to the other catamarans because he believed the boat was now dangerously unstable. Personnel aboard a Coast Guard motor lifeboat, which had arrived on the scene at approximately 6:15 p.m., removed the four crewmembers and the deceased passenger from the disabled vessel.

The two other injured passengers were airlifted to a local hospital. One had suffered lacerations to the head and was given precautionary treatment for neck and spinal injuries. The other also had head injuries and was transported to the Maui Medical Center for further treatment.

The catamaran was then abandoned because darkness had begun to fall and its starboard engine room had completely flooded. The Coast Guard launched an aircraft to search for the vessel the next morning, but could not find it. That afternoon, local property owners on Molokai discovered partial wreckage of the vessel on the southeast coast of the island. Because the vessel had broken up on the offshore reef, only the mast step and the lower portions of the rigging could be recov-

ered for analysis. Portions of the vessel's hull, the mast, spreaders, sails, and standing rigging were lost at sea.

COAST GUARD RECOMMENDATIONS

The Coast Guard advised that a civil penalty be brought against the owner of catamaran 1 for his failure to submit plans for review and approval for the modifications made to the vessel as required by 46 CFR 176.700. There was no evidence of negligence by the captain or crew of catamaran 2; in fact, during interviews by investigators, many of the passengers commended them for their presence of mind and professional competence.

The two dismastings prompted the Coast Guard to recommend the following actions.

Set national standards for standing rigging. A national minimum standard should be developed for masting and rigging of sailing vessels, with guidance from navigation and vessel inspection circulars and the Marine Safety Manual. A standard schedule should be implemented to unstep the mast for periodic inspection and third-party surveys.

Conduct sail plan reviews. A regulations working group should be chartered to establish uniform design and construction standards for mast and rigging equipment on inspected sail vessels. Pending completion of the project, the Coast Guard should consider requiring submission to the Marine Safety Center of a naval architect's or marine engineer's report certifying that the proposed sail plan and rigging configuration have been reviewed and that they are appropriate for the proposed service. This report should identify the methods used to ensure that the mast is stable.

Establish rigging surveys. Because modern sailboats have such complex and diverse designs, the Coast Guard will have to continue to rely on third-party-prepared surveys, furnished at the owner's expense, to help guide inspectors. Standards should be developed



The wreckage washed up on a beach off the southeastern shore of Molokai.

that will enable the OCMi to objectively evaluate these surveys. In addition, the Coast Guard should publish uniform minimum standards for rigging surveys, to include:

- initial review of the rigging system and comparison to the original sail plan;
- inspection of all fittings and terminals;
- inspection of chain plates, clevis pins, toggles, terminals, and wires for corrosion and wear;
- measurement and recording of rigging tension of all stays and shrouds;
- inspection of mast column and comparison to previous surveys;
- inspection of spreaders and their alignment;
- inspection of gooseneck and fittings;
- inspection of mast step to include a dye penetration test.¹

Develop marine inspection training. Headquarters should review the existing rigging inspection training program at the Reserve Training Center and develop an advanced curriculum on sail configuration, rigging design, and rigging maintenance and inspection. Job aids and checklists should also be developed for marine inspectors in the field. In addition, program managers should consider establishing a sailboat rigging course of excellence or a third-party training center for marine inspectors assigned to ports with auxiliary sail vessels. Successful completion of a rigging course should be required for any inspector conducting inspections of sail vessel rigging systems. The course should include a case study of the accident on catamaran 1.

Vessel History: Prior incidents

The Coast Guard investigation revealed that catamaran 2 had experienced two previous dismastings in a 15-year period before the March 25, 2007 accident.

1. On April 23, 1991, the vessel was underway with 39 passengers and three crew when the port lower spreader failed, causing the mast to fold to the starboard side of the cabin top, extending out over the quarter of the vessel. No one was injured. In the opinion of the marine surveyor, this dismasting was caused by a fracture at the base of the port spreader, possibly caused by columnar loading, which allowed the spreader to collapse.

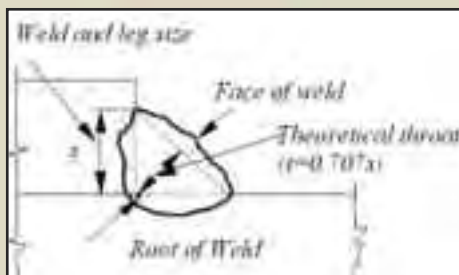
2. On April 29, 1996, the vessel was again dismasted, this time with 14 passengers and three crewmembers aboard. The mast tore at its base and broke off the vessel. Two passengers had minor injuries after being struck by parts of the rigging. Although required by 46 CFR Part 4, there was no record that a Report of Marine Casualty had been submitted to the Coast Guard, nor was there evidence that a Coast Guard marine casualty investigation had been conducted on this dismasting. The only evidence of this casualty in Coast Guard files was a report written on April 30, 1996, by a marine surveyor, which included a statement from the vessel's manager that the mast was severely bent at the lower spreader and that it had likely torn out of the mast step.

March 25, 2007: Mast Step Failure

The masts of all sailing vessels are designed to deflect under load (wind). The load is then transferred via the mast and standing rigging to the vessel itself. Because of the significant amount of flexing between a catamaran's hulls, proper tensioning of the standing rigging is critical.

The mast step collar on this vessel was fillet-welded on the inside, but did not have any type of structural reinforcement to withstand the twisting forces at the bottom of the mast column.

Given the weather conditions on the day of the accident, the mast step and collar



Typical fillet weld

were exposed to a substantial amount of twisting. Investigators learned that the mast step had extended up into the base of the mast a good eight to 12 inches. The height of this collar may have increased the fore and aft loading on the attachment point.

The vessel had been headed downwind on a port tack, which subjected the collar of the mast step to counter-clockwise twisting. Because the collar of the mast step had already been weakened by a stress crack (only discovered after the accident), the mast step may have failed first, so that the compression force of the wind and rigging thrust the mast foot over the starboard side of the vessel. The collar then sheared off cleanly at the base of the mast step.

As soon as this happened, the mast column fell to the side opposite the existing winds. The vessel's mast had last been unstepped on October 16, 2006 during drydock. No report of damage to the mast step was noted at that time.

Coast Guard Conclusions

The mast step was recovered in the wreckage that washed ashore on the island of Molokai, but the vessel's mast was lost at sea. However, all of the chain plates and standing rigging, such as the connection points on the hull for the shrouds and stays, were still attached to the vessel when it was found. The shrouds and stays showed evidence of having been cut during rescuer's attempts to release the trapped accident victim.

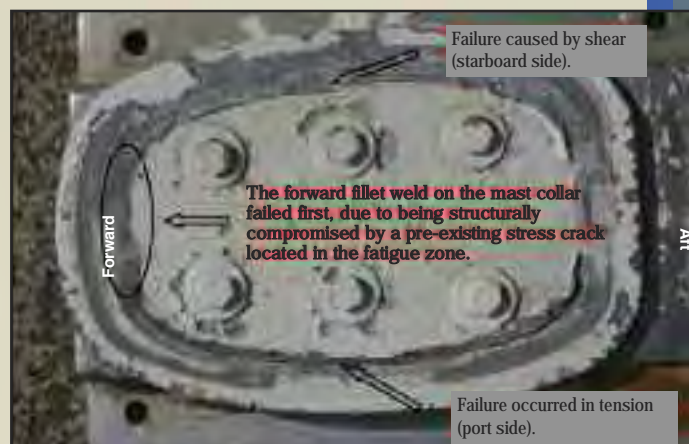
Though the exact cause of the dismasting will never

be known, forensic investigators were able to piece together what probably happened. The mast step was sent to a laboratory for metallurgic examination, where a forensic engineer examined it with an optical stereomicroscope (up to 40 times magnification) and a scanning electron microscope. According to the report:

"The fractographic¹ examination revealed the mast step failure to have originated at the forward position of the mast step ... A fatigue zone was found to extend ... on the forward portion of the mast step in the fillet weld connecting the aluminum base to the mast step's collar. The remainder of the weld failure was catastrophic in nature, which would indicate that the failure was created by a sudden overload. The failure at the ... port side of the vessel was the result of tension, while the failure at the ... starboard side of the vessel was the result of shear. A section containing the entire fatigue zone was removed and further examined. This examination confirmed the initial failure of the mast step to be the result of a stress crack ... at the root of the fillet weld located on the inside of the mast collar, and then spread across the weld throat. Some corrosion pitting in the stress crack was observed, indicating that the crack was present for an undetermined amount of time before the dismasting.

Endnote:

¹ Fractography is the study of fracture surfaces of materials. Different types of crack growth (e.g. fatigue, stress corrosion cracking) produce characteristic features, and fractographic methods are routinely used to determine the cause of failure in engineering structures by studying the characteristics of a fracture surface.



Close-up of mast step.

LESSONS LEARNED

Lessons for Sailors

Inspect your mast and all the rigging components carefully at least once a year. If you are unsure of what to look for, pay a surveyor or rigger to conduct the inspection. Don't modify the rig without the direction of someone skilled in the art of rigging.

Recognize that the design and stability characteristics of catamarans differ significantly from monohulls and make allowances for those differences.

Lessons to Owners/Operators

Safety never takes a vacation. What might look good, cost less, or seem expedient at the moment is seldom the wisest choice. This story underscores unvarying themes: Boating is not a risk-free pastime, and water is an unpredictable environment that must command respect. Those who make their living on the water—particularly those who are responsible for the lives of others—should remember that everyone's safety depends on maintaining that respect. It is when a person skips safety protocols or cuts corners that accidents are most likely to occur.

OUTCOME

The Coast Guard agreed to take no administrative or legal action against the owner of catamaran 1 because he voluntarily surrendered his license. After a new mast and boom were installed, the catamaran was returned to service as an inspected auxiliary sail vessel. Though he is no longer the captain, the owner continues to operate the vessel as a tour boat, managing sight-seeing cruises for tourists around the island of Oahu.

As a result of both these catastrophes, Coast Guard inspectors boarded all inspected sailing vessels in Hawaii to conduct detailed examinations in April and May of 2007. Of the 59 vessels inspected during that surge operation, 41 passed without discrepancies, but problems were uncovered in the remaining 18. Of those 18, 11 vessels had excessive corrosion, fractures, or missing bolts in the masts or spreaders, which required repair before the Coast Guard would approve resumption of sail operations.

When the fleet learned of the operation through a Marine Safety Information Bulletin, two operators voluntarily took their non-compliant sailing vessels out of service, and converted them to motor-only operations.

In early 2008, during a Honolulu Industry Day, the Coast Guard held a public session focusing on sail rig-

ging inspection. Thirty representatives of the passenger sailboat industry; several marine surveyors, inspectors, and investigators from Coast Guard Sector Honolulu; and a member from Coast Guard headquarters' Quality Assurance and Traveling Inspectors staff met in Honolulu to discuss best practices in rigging inspections.

In the summer of 2008, the Coast Guard developed—and distributed to sailing catamaran owners in Hawaii—a local policy guidance (entitled Sector Honolulu Inspection Note #13) that outlined an enhanced inspection system for sail rigging, masts, and associated components of inspected small passenger sailing vessels. Several local catamaran designers and builders also conducted peer reviews.

The following Coast Guard Marine Safety Alert was released in July 2009:

"The Coast Guard strongly reminds all commercial vessel owners/operators, especially those of passenger carrying sailing catamarans of similar build, of their responsibility to maintain their vessels, associated equipment, systems, and components in a satisfactory condition suitable for their employed service at all times. Owner and operators should not wait until regularly scheduled Coast Guard inspections to identify problems but should be ever vigilant and implement routine inspection, maintenance, and repair procedures in accordance with good marine practice and in alignment with applicable requirements. Owners and operators should consult the vessel manufacturer or other naval architecture, marine engineering services, or qualified rigger regarding any concerns they might have regarding the regular flexing and working of their vessel's standing rigging."

Said the Officer in Charge of Marine Inspection for Hawaii:

"These tragedies highlighted a need for a more rigorous inspection and survey program. I spoke with both families...and assured them that these accidents did not occur in vain."²

Perhaps long overdue, and unfortunately too late for the accident victims, the new Coast Guard inspection regime for sailing vessels will likely save lives so that similar tragedies can be avoided in the future.

About the author:

Ms. Carolyn Steele has more than 20 years of experience in the communications field. As a freelance writer/editor she has worked on numerous Coast Guard projects since 2006, including the USCG Marine Safety Manual, the USCG Maritime Law Enforcement Manual, and USCG Publication 1. She is also the editor and designer of the Crew Endurance Management newsletter and designs VRP Review, a newsletter published by the USCG vessel response team. Besides writing and graphic design, Ms. Steele has an extensive background in fine art.

Endnotes:

¹ In a dye penetration test, the mast step is immersed into or sprayed with a special liquid which penetrates deeply into cleavages, pores, or cracks. After immersion, the liquid adhering to the surface is rinsed off and the mast step is then coated with a chalk film. The dye penetrates the dried chalk film, which is still stored in the flaws. The flaws emerge clearly and strongly enlarged on the white surface, so that even ultra-fine cracks become visible.

² Coast Guard News, April 30th, 2009.

Acknowledgements:

Proceedings gratefully acknowledges the support of CAPT David Fish, Mr. Charles Barbee, LCDR Paul Rudick, LT Stephen Thompson, and Mr. Ken Olsen, U.S. Coast Guard Office of Investigations and Casualty Analysis.



Lessons Learned

from **USCG Casualty Investigations**

The Weak Link

Tragic consequences for a diver despite a host of safety protocols.

by Ms. CAROLYN STEELE
Technical Writer

“My air, my air, my air, my air!”

When the crewmembers aboard the M/V *Mr. Fred* heard this frantic cry from one of their divers, 103 feet underwater in the Gulf of Mexico, it was 50 minutes into an uneventful dive. Their first hint of trouble had been a few seconds earlier, when the sound of the diver’s breathing ominously stopped as they listened over their vessel’s audio feed. By the time the dive team could bring him to the surface and attempt to revive him, he had been unconscious for several minutes. It was too late.

The ship, designed to serve as a dive support vessel, was fully equipped with multiple life support systems and personnel on hand to help if problems developed. The mystery was how this tragedy could have happened, given all the back-up safety systems in place.

Background

The dive support vessel was owned and operated by a marine contracting company hired to work on a sub-sea pipeline in the Gulf of Mexico off the coast of Louisiana. The job had been divided into two phases, each requiring several dives. The first phase of the job required the divers to locate the buried 12-inch pipeline by surveying the seabed in approximately 200 feet of water. After finding the pipeline, divers were to use low-pressure water jets to remove the mud surrounding it, then mark it with sonar reflectors.

The second phase of the job required the divers to install a conductor guide jumper inside an existing bell

guide. The conductor was at a depth of 103 feet, about 100 feet above the seabed. The victim of the casualty was working on phase two.

At 2:30 p.m. on July 4, 2002, the dive superintendent boarded the vessel while it was at the dock. That afternoon, he inspected the dive equipment aboard the vessel and ran its compressors to ensure they were functioning properly. All the gear tested satisfactorily. The dive team reported aboard and the vessel got underway at 12:15 a.m. on July 5, arriving at Eugene Island Block 273 at 10 a.m., where they picked up the hiring company’s representative, who would instruct the crew on their tasks.

On the morning of July 6, after receiving the details on phase two of the job, the dive superintendent developed a schedule of dive rotations and briefed the divers on their assigned tasks. During phase two, all divers would breathe surface air rather than mixed gas, because the maximum depth was only 117 feet. (The breathing gas mixtures of oxygen, helium, and hydrogen for extreme depth use are designed to reduce the effects of high pressure on the central nervous system.)

The rotation the dive superintendent designed followed a standard sequence: each diver rotated through the positions of rack operator, standby diver, and main diver. The 11th diver in the rotation had served as the standby for the previous dive, so his helmet was moved over to the main diver’s umbilical in preparation for his dive. All his equipment was meticulously tested, as was routine aboard the vessel. His job would be to burn off the rough end of a conductor with an acetylene torch, leaving a smooth edge.

continued on page 84

DEFINITION OF TERMS

EQUIPMENT

Air compressor. The air compressor provides breathing air directly to a surface-supplied diver. During normal diving operations, the vessel will have two compressors running. This is a safety feature to ensure that the second compressor can immediately pick up the entire load if the first one fails.

Air hose. The air hose is the main source of breathing air for the diver. It is secured to the diver's harness at the D-ring and then attaches to the hose adapter on the side of the helmet.

Bailout bottle. The bailout bottle is an emergency air supply tank filled with compressed air. The diver's regulator is attached to this bottle. A low-pressure air hose or "whip" connects the regulator on the bottle to the auxiliary valve on the diver's helmet.

Defogger/freeflow valve. This is one of two routes that the helmet uses to deliver air, the first being through the demand regulator, which can be supplied with air "on demand" from the surface through an umbilical and from the emergency air supply/bailout bottle. The defogger/freeflow valve blows a steady stream of air directly into the interior of the helmet. The defogger/freeflow valve can also be fed air from the umbilical and the bailout bottle.

Dive manifold. The dive manifold (also referred to as the "rack") is a manually operated structure that links life support systems to the diver in the water. The dive manifold is designed with multiple and redundant safety features. It receives air and/or mixed gas input from six separate supply lines, and can provide life support to three separate divers and air to a pneumofathometer system that is used to gauge the divers' depths.

Dive regulator. The gas pressure dive regulator has one or more valves in series, which let the gas out of a gas cylinder in a controlled way, lowering its pressure at each stage. The regulator supplies the diver with breathing gas at ambient pressure from the vessel. The gas may be air or one of a variety of specially blended breathing gases.

Hyperbaric chamber. This is used to bring divers who have been working at depth slowly back to normal air pressure, allowing them to exhale nitrogen harmlessly. Hyperbaric chambers have hatches large enough for people to enter and exit, and an air compressor to raise internal air pressure, allowing divers to decompress by maintaining the same pressure at which they were working.

Pneumofathometer. The pneumofathometer is a small open-ended air hose that the diver usually tucks into his dive harness. The rack operator uses it to monitor the diver's depth in the water by charging it with air until bubbles come out at the diver's end. The air supply for the "pneumo" is then turned off and the diver's depth is determined by reading the backpressure of the air as water flows into the open end of the pneumofathometer.

Tugger. The tugger is a wire rope used to pull equipment up from the diver's workstation to the vessel. It is fed onto a winch located on the vessel's aft deck. The controls for the tugger are located at the winch, which dive tenders on duty normally operate.

Umbilical. Located aboard the vessel, an umbilical consists of six items:

- a safety line,
- a cable for the video camera,
- a cable for communications,
- a hot water hose,
- a pneumofathometer,
- an air hose for breathing.

PERSONNEL

Dive superintendent. The superintendent oversees the entire operation, including all personnel. The superintendent is responsible for handling dive equipment and supplies, pre-job planning, anchor positioning, and other functions. He also oversees the operation of the dive equipment aboard the vessel including the compressors, volume tanks, dive manifold, and compressed gas bottles. The superintendent handles paperwork, payroll, performs the job safety analyses, and ensures that safety meetings are held.

Dive supervisor. The supervisor stands duty in the dive shack and guides and oversees the main diver, tenders, rack operator, and all other operations aboard the vessel that support diving. He maintains communications with the vessel's master and ensures that the dive tables are being followed during each dive. According to this company's diving safety manual, the supervisor must be in immediate control and available to implement emergency procedures. The dive supervisor typically remains in the vessel's dive shack during diving operations. From this location, he can easily oversee the entire operation.

Tender. The tender is the surface member of the diving team who works most closely with the diver on the bottom. At the start of a dive, the tender checks the diver's equipment and topside air supply for proper operation and suits up the diver. Once the diver is in the water, the tender constantly tends the lines to eliminate excess slack or tension. The tender keeps the dive supervisor informed of the line-pull signals and amount of diving hose/tending line over the side, and remains alert for any signs of an emergency.

Standby diver. This is a fully qualified diver who is required to be dressed out and ready to enter the water immediately if needed to assist a stricken diver. He is also required to monitor communications between the main diver and the dive supervisor/rack operator, as well as progress being made on the job.

Rack operator. The rack operator is a fully qualified diver. Primarily, this person operates the dive manifold. The rack operator has multiple duties including:

- keeping time for the diver in the water;
- ensuring the diver has the proper air supply and the correct air pressure;
- maintaining communications with the diver, guiding him throughout the dive;
- relaying orders from the diver to the dive tenders, ensuring the tenders comply;
- completing dive sheets for each dive, recording such things as dive times and depths.

A standby diver and dive tenders helped him suit up, check his gear, and enter the water.

Timeline

The clock in the video camera mounted on the diver's helmet displayed the time in hours, minutes, and seconds, which were recorded in the Coast Guard report written after the incident. When the camera was first turned on, the recorded time was 8:08 p.m. For over half an hour, the diver could be seen performing his assigned tasks. At 8:39:56, he picked up the end of the tugger, which was tied off a few feet away from his workstation, and began to reposition it.

Between 8:41:20 and 8:42:33, he attached a shackle to the end of the tugger and used his knife to cut the first of two lines securing the tugger to the anode on which it had been tied off. Starting at 8:42:33, and continuing for the next 49 seconds, a high-pitched whistling could be heard on the videotape—the sound of air flowing through the defogger/freeflow valve on the diver's helmet.

At 8:43:02 p.m., the diver asked, "You coming up on some of that tugger slack?" The rack operator responded, "Roger that...coming up on tugger slack." The rack operator relayed this order to the three tenders on deck, who carried it out. The tenders were at the stern of the vessel and away from the tugger's winch at the time, so it took them 30 to 45 seconds to carry out the order.

The tugger had been laid out so that it ran down the center of the vessel's deck, over the stern and into the water. The diver's umbilical ran a parallel path down the starboard side of the deck. A distance of about 10 feet separated the tugger and the umbilical. The lead tender picked up the diver's umbilical and held it to ensure it remained clear of the moving tugger. The lead tender later told Coast Guard investigators that the umbilical did not get entangled with the tugger at any time.

At 8:43:22, just as the tenders were about to carry out the first tugger order, the background whistling sound on the videotape suddenly stopped. The diver could be seen pausing and reopening his knife, and for the next 32 seconds he could be heard breathing normally. At 8:43:28, he used his knife to cut the second line that was holding the tugger in place. Up to this point the camera mounted on his helmet had recorded him looking straight ahead while performing his tasks. But as he

tried to cut the line, he moved his head up and down four times in quick succession.

Thirty-seven seconds after giving the first tugger order, the diver repeated, "Are you coming up on some of that tugger?" The rack operator replied, "Yeah, we're working on it. Give us a sec., we've got to get some people into position."

Twelve seconds later, in a calm and normal voice, the diver said, "All stop."

The lead tender on deck had only brought the tugger in three or four feet, but stopped at once when he heard this order. At 8:43:54, the diver stopped breathing normally, and five seconds later he said, "Slack the tugger; slack the tugger." Ten seconds later the diver could be heard struggling to inhale without receiving any air from the demand regulator. Four seconds after that he repeated, "Slack the tugger." For the first time, his voice sounded strained.

At 8:44:11, in a highly distressed voice, the diver exclaimed, "My air, my air, my air, my air!" The rack operator responded immediately, ordering the tenders, "Slack the tugger. Slack the tugger." The rack operator slacked the tugger for about 10 seconds, letting out another 20 feet of cable. He then checked the dive manifold and saw that all the valves were lined up properly, and that the air pressure was correctly reading 200 psi. He later told Coast Guard investigators that, except for operating the pneumofathometer, he never changed the positions of any valves during the fatal dive.

At 8:44:32 p.m., the diver gasped, "My air," one last time. After that, the videotape recorded the sound of water flooding into the helmet, followed by the image of water moving past the camera as the diver's helmet slowly descended through the water.

At 8:44:48 an order was given: "Jump the standby diver." Within seconds, the standby diver entered the water, taking hold of the main diver's umbilical and following it down. Two minutes later, the standby diver reached the main diver at a depth of 107 feet. He found him unconscious, with his helmet and neck dam removed. The standby diver took hold of his crewmate, and the dive tenders aboard pulled both men up. The diver was not breathing and had no pulse when he was brought aboard the vessel. The dive superintendent ordered the dive medical technicians out on deck, and they performed CPR for approximately 15 minutes, but the diver was not responding.

At 9:05 p.m., the unconscious man was placed on a stretcher and transferred to the hyperbaric chamber. The dive medical technicians continued to perform CPR.

The victim could not be flown out via medevac because he needed to remain in the decompression chamber, so the dive superintendent ordered the dive supervisor to start an emergency evacuation from the site to get him back to shore. Crewmembers cut the two stern anchor wires that had been tied off to the rig as spring lines, as well as all other diving lines and cables. CPR was continued on the victim until 9:52 p.m., when the vessel's hyperbaric doctor told the company's safety representative that it should be stopped. The diver could not be revived.

The vessel carrying the victim arrived in Morgan City, La., at 6:30 the next morning.

According to the coroner's autopsy report, the cause of the diver's death was "asphyxia due to equipment failure—dive accident." A toxicology report revealed no drugs in the diver's system.

The Investigation

When the vessel arrived at the dock, two investigators from the U.S. Coast Guard's Marine Safety Office in Morgan City, La., boarded and met with the vessel's master, the company representative, and the dive superintendent.

The dive superintendent explained what had happened during the dive and showed the investigators the equipment involved. The investigators took initial statements from members of the dive team and took possession of the downed diver's equipment for examination.

Vessel diving systems. The dive umbilical the victim used was removed from the vessel and inspected and tested on July 10, 2002. The entire length of the umbilical was laid out and visually inspected. No signs of binding or crimping were noted. Air was blown through both the air hose and the pneumofathometer to check for blockages, and both lines were found to be clear. The breathing hose passed the standard hydrostatic test, showing no signs of leakage, bulging, or other discrepancies.

Each of the life support systems used aboard the vessel during the dive was also tested and inspected as a part of the Coast Guard's investigation. All three compres-

sors passed the inspection/testing process. Air quality analysis was performed on the breathing air generated by the compressors; each was shown to be within satisfactory specifications for carbon monoxide, carbon dioxide, oxygen, liquid particles, and hydrocarbons. The dive manifold, or rack (Figure 1), was given a thorough inspection, and all lines were clear of obstructions. Every valve and gauge was tested under pressure and found to be working properly. The dive manifold was checked for leaks; no leaks were detected.

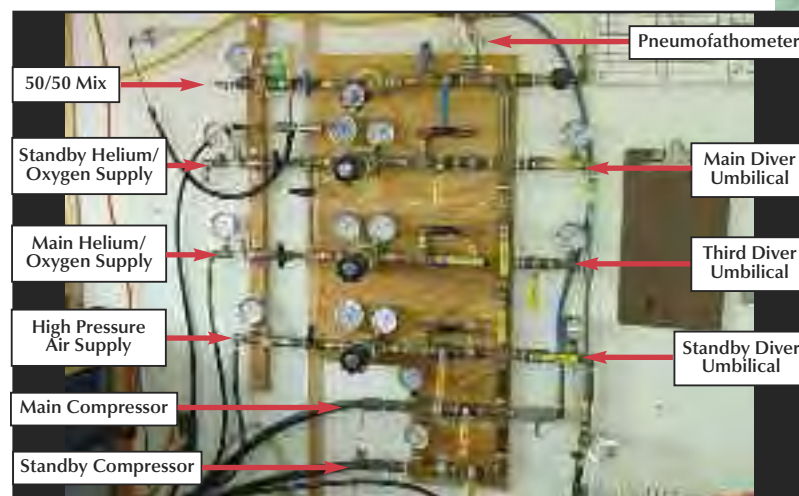


Figure 1. The dive manifold or "rack," which features multiple redundant safety features, links life support systems to a diver in the water.

At the conclusion of the tests, air was allowed to flow freely from the main compressor, through the volume tank, through the dive manifold, and then to a dive umbilical. The end of the dive umbilical was left open to test the system's overall ability to maintain airflow. The breathing air supply system kept up with the open umbilical, and maintained proper pressure to the volume tank and the dive manifold.

Crew actions. Crewmembers who later testified to Coast Guard investigators told them the following:

- The communication wires to diver #11's helmet had been attached securely—the communications tested fine. After the helmet was attached and the fittings were checked, the rack operator charged the air hose for his umbilical to 200 psi from the vessel's air supply system. Throughout the entire dive, the standby diver's umbilical was left charged with air and ready for immediate use in the event of an emergency, which was standard procedure.
- The standby diver checked the integrity of the seal between the main diver's helmet and neck dam

after he had put his helmet on, verified that he had good communications with the dive shack, and inspected his bailout whip. The standby diver then watched as the main diver successfully tested the emergency air supply by opening the valve on the bailout bottle and the auxiliary valve on the helmet.

- A dive tender was present when the main diver put on his bailout bottle, helmet, and gloves. The tender said that the neck dam and the helmet were properly sealed, with the O-ring covered. He also confirmed that the rear hinge tab on the helmet and the alignment sleeve on the neck dam were properly connected. After the diver put on his helmet, the tender saw that he was able to breathe normally through the umbilical and regulator. He watched as the diver connected the whip from the bailout bottle to the helmet, and observed him opening the valve on the bailout bottle and the helmet's auxiliary valve to verify that the bailout system was working properly.

Recipe for Disaster

Though all these systems checked out properly, and all mandatory safety protocols had been followed, the one "wild card" was the diver's helmet. This was his personal property, and, as such, his own responsibility to ensure it was in good working order. Dive assistants aboard the vessel had taken note of the tests the victim performed on his personal gear. Their observations would later help shed light on the casualty.

Because the marine contracting company did not require such tests, the defogger/freeflow valve on the casualty victim's helmet had not been tested, nor was the purge button depressed on the helmet's demand regulator.

Recollections of diver's actions prior to the casualty.

When asked by Coast Guard investigators, the standby diver said that the casualty victim would normally open the defogger/freeflow valve to let air free flow into the helmet before a dive, but that he did not remember seeing him do so that day. The manufacturer of the dive helmet requires divers to do this to prevent the exhalation ports from reversing and allowing water to enter the helmet.

Though the standby diver did not notice any problems with diver #11's equipment just before the fatal dive, he did observe that the rubber outer jacket on his bailout whip was coming off. Though he pointed this out to him, diver #11 said he already knew about it and that it was okay. (After the casualty, the victim's personal belongings aboard the vessel were inventoried, and a new bailout whip was found in his stateroom.)

The dive tender assisting diver #11 testified he did not see him test the defogger/freeflow valve on his helmet, nor did he see him depress the purge button on the front of the demand regulator. According to 46 CFR 197.346(d), it's required that the diver have "a weight assembly capable of quick release." Though the diver had a quick-release weight belt, he told the tender that he was not going to use it on this dive. He did not explain why.

Description of diver's equipment. The casualty victim's dive helmet was a fiberglass helmet weighing 29 pounds and equipped with a clear polycarbonate face port. The helmet had fittings on its right side for two air hoses: one to provide surface-supplied air from the dive support vessel, and one to connect to the emergency air supply/bailout bottle. The helmet had redundant systems built into it to ensure that breathing air was continuously available to the diver in the event of a single-point failure.

There were two routes on the helmet to deliver air to the diver—the first through the demand regulator, which could be supplied with air "on demand" from the surface through an umbilical and from the emergency air supply/bailout bottle. The second air route was through the defogger/freeflow valve, which blew a steady stream of air directly into the interior of the

helmet. The defogger/freeflow valve could also be fed air from the umbilical and the bailout bottle. These two systems were virtually independent of each another.

Post-casualty analysis of the diver's equipment.

The accident victim's personal dive gear was tested and inspected by the U.S. Navy's Experimental Diving Unit (EDU). Both the EDU and the Coast Guard noted that though mold was growing inside the hel-



Figure 2. The diver's mask.

met's oral nasal mask (Figure 2), it was still functional. The EDU reported that the main helmet exhaust valve (water dump) also had dried mud around its edges.

The EDU ran three separate operational tests on the helmet. Each time the tests had to be halted because water flooded the breathing system. After the first attempt, debris was found in the exhaust valve, which kept the exhaust valve from sealing properly. The valve was also dry-rotted and muddy. The debris was removed, and a second test was run on the helmet, only to be halted because water continued to enter the breathing system.

When investigators opened the demand regulator, they found a foreign object about the size of a nickel inside, beneath the roller lever, on top of the bias adjustment tube (Figure 3). The object left a rust-colored stain on

Examinations showed that the diver's defogger/freeflow valve assembly also needed maintenance. EDU reported that when first pressurized, the valve was in the open position and allowed a moderate rate of airflow, but that the control knob could not manage the rate of airflow because it didn't function properly and could only be turned when forced. When they took the valve assembly apart, investigators discovered the culprit—it too was coated with fine mud, the stem was worn, and there was a leak at the packing gland.

Unraveling Mysteries

Why was the diver's helmet in such poor condition?

After uncovering so many problems with the diver's helmet, investigators focused on finding the source of the mud and the foreign object found inside the victim's regulator.

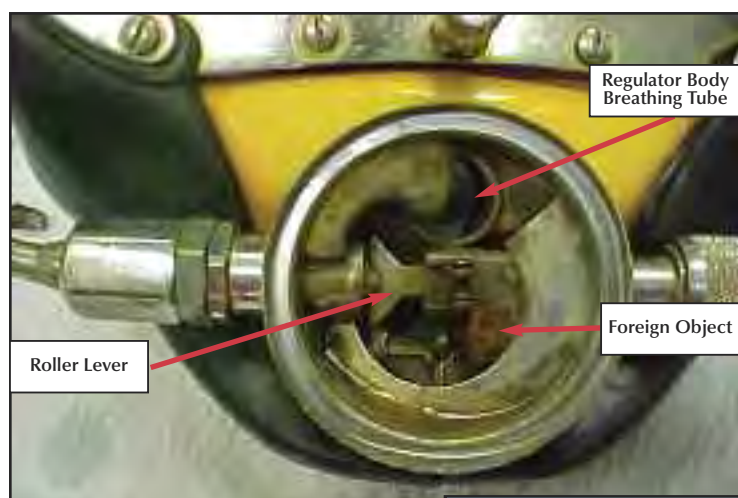


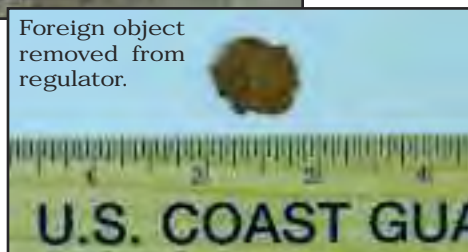
Figure 3. During the post-incident investigation, a foreign object was found in the regulator.

the regulator body, indicating it had been there for some time. This object prevented the regulator from working properly. Based on its size, the EDU concluded that the object could only have entered through the regulator body breathing tube.

In addition, the roller lever was loose, which prevented the purge button on the front of the demand regulator from providing air when depressed. The helmet was tested once more, but water continued to enter it, so the test was stopped. When they disassembled the demand regulator, investigators found that its internal components were encrusted with fine mud, preventing them from moving freely within the regulator.

Earlier diving accident. It turns out the casualty victim had had an earlier diving accident in which his helmet was knocked off his head, on June 6, 2002. The internal incident report form stated: "Diver's hat came off his head while jetting inside cofferdam." The job had involved blasting dirt and sand away from the base of a wall using a 200-psi waterjet system.

The diver, who had been working at a depth of 12 feet, told his supervisor that the water flow from the jet nozzle had knocked his helmet off into the swirling debris and sediment. The dive supervisor notified the company of the incident, and instructed the diver to tighten his helmet. The diver later reported that he had fixed the problem. According to his commercial diver logbook, he used the helmet on five dives following the



June 6th incident, though he did not enter this particular event in the logbook. He did not report any problems with the helmet after this happened.

After the July 6th fatality, investigators contacted all authorized dealers in the Gulf of Mexico to find out if the diver had taken his helmet to be professionally serviced after the June 6th incident. None of them had any records indicating that he had done so.

The casualty victim had been trained in helmet maintenance in dive school, and it was known to have done some maintenance himself. He had tightened the hel-

met/neck dam connection after the June incident, and replaced the neoprene in the neck dam on the day before his fatal dive. However, the fact that the helmet's internal components were in such bad repair indicates that no in-depth maintenance had been performed.

Why did the diver give repeated tugger commands? Diver #11 gave his first tugger command at 8:43:02. It took the tenders on deck 45 seconds to carry out that order. The fact that the tugger was being moved for the first time during the dive at the precise moment diver #11 lost his air supply made it seem like the tugger caused the accident. The evidence, however, shows that this was only a coincidence.



Figure 4. The tugger control station.

When the diver was first heard straining to breathe, the tenders were already slackening the tugger (Figure 4). If the tugger had crimped the umbilical when it was pulled in three or four feet, its grip would have loosened when the tenders let it out 20 feet a few seconds later. With 200 psi of air flowing into the line, breathing air would have been restored almost immediately. The fact that this did not happen indicates that the tugger did not crimp the line.

In addition, the standby diver said that when he recovered his stricken crewmate, he had taken hold of his umbilical at the surface and followed it all the way down. He said that the umbilical was free of entanglements for its entire length as he descended. The accident victim may have thought the tugger was the cutting off his air supply, but in fact it was not.

Why did the diver look up and down repeatedly moments before giving the tugger orders? It is possible that the diver was checking the position of the tugger because, when he started to experience shortness of

breath, he thought it was due to the tugger cutting off his air supply.

Why did the metallic object in the diver's helmet dislodge when it did? Unfortunately, given the condition of the diver's helmet, this was an accident waiting to happen, and could have occurred at any time after the June 6th incident. It is possible the diver's rapid head movements, recorded moments before he lost his air supply, dislodged the object in his regulator and caused it to move into its final, fatal position.

Why did the diver remove his helmet? According to both commercial and military divers, this is the worst thing a helmet diver can do at depth. In the words of Coast Guard Dive Program Assistant Manager Chief Phil Roy, "At dive school we instruct our divers: 'You do not take that hardhat off.'"

The standby diver, who arrived on scene a scant two minutes and thirty-eight seconds after the main diver first indicated he had a problem, could have inserted the pneumofathometer into his crewmate's helmet if he had left his helmet and neck dam on. This would have at least provided a supply of air if the victim had tried to breathe while being rescued.

It is likely that diver #11 took off his helmet after all his other options had been exhausted. Because of the foreign object obstructing the air supply in his regulator, none of the back-up systems he tried worked. He had not worn a weight belt on this dive, so at the last moment, panicked and starved for oxygen, it's possible he pulled off the one thing weighing him down in the water—his 29 lb. helmet—in a final, desperate attempt to rise to the surface for air.

Conclusions

The demand regulator on diver #11's helmet stopped functioning because of three basic problems: the metallic object that had lodged inside it, the fine mud that encrusted it, and the looseness of its internal roller lever. As a result, the diver could not breathe surface-supplied air from the vessel via the umbilical, nor could the regulator provide him with emergency breathing air from the bailout bottle he was carrying as backup.

In addition, the defogger/free flow valve was badly worn and also encrusted with fine mud. This made the control knob difficult to operate and rendered the valve unresponsive when the knob was turned. The casualty victim was apparently unable to activate it during the

emergency. As a result, he suffered a complete loss of airflow within the helmet.

Only 22 seconds had elapsed between the time diver #11 first said he was out of air and the time he removed his helmet. During this brief period it appears that he tried to follow most of the recommended emergency procedures. He tried to activate the emergency air supply by opening the auxiliary valve on the helmet and thereby supply air to the demand regulator from his bailout bottle. He also tried to open the defogger/free flow valve on his helmet. Both of these efforts failed, however, because the demand regulator had been rendered inoperative, and the defogger/free flow valve was stuck.

Unfortunately, the loss of air was so sudden and catastrophic that no one had enough time to save the victim. Everyone on the team did as much as could be expected under the circumstances. When the rack operator and dive supervisor realized what was happening, they checked all the valves on the dive manifold for proper positioning and the pressure gauges to ensure air was still flowing to diver #11, and charged the pneumofathometer. The standby diver entered the water and began his descent a mere 65 seconds after the main diver made his first distress call.

The only standard emergency procedure that diver #11 did not follow was to slide the pneumofathometer underneath his neoprene neck dam and into his helmet. Though this would have taken several seconds, it might have provided him with an alternate source of breathing air and saved his life.

It was clear that all the problems with the victim's helmet could have been avoided if he had performed preventative maintenance. All the safety features built into the helmet to protect a diver from a single-point failure were rendered ineffective by this lack of maintenance. The foreign object in the regulator, the deteriorated condition and looseness of the helmet's internal components, and the fine mud encrusted in the defogger and the demand regulator all contributed to the failure of the helmet. Both the heavy wear on the parts inside of the defogger and the fact that a rust-colored stain had developed in the regulator where the foreign object was found indicated that the diver's helmet had needed servicing for some time.

Lessons to Be Learned

For divers. Safety begins and ends with you. Checking your gear is imperative. It is a sign of professionalism and respect for the dangers that your job entails. Although your job requires confidence in your ability to deal with underwater situations, that confidence should be an asset in performing tasks safely, not a deterrent to performing those tasks professionally.

For the diving industry. According to Phil Newsum, executive director of the Association of Diving Contractors International, this case shone a spotlight on safety issues in the industry. In his words:

"This particular incident was a landmark one. Because of the issues associated with the diver's helmet (specifically, the apparent lack of routine maintenance), the industry's leading U.S. offshore diving contractors launched a major initiative to institute a mandatory annual helmet and mask inspection program. As a direct result of this fatality (per manufacturer's requirement), annual internal and external inspections of helmets and masks need to take place, whether the helmet is personal property of the diver or company owned. Helmets should readily display a sticker, which indicates the date of the external inspection. Most diving contractors require their divers to submit copies of their helmet inspection certificates before they are allowed to participate in any underwater operations."¹

This "Lessons Learned" series usually focuses on the operation of vessels and the actions of their crews on the water. In this case, the accident occurred more than 100 feet below the water's surface. However, this story is similar to the others in that it underscores a consistent theme: Water is a dangerous environment that demands respect.

Endnote:

¹ Personal communication with Phil Newsum, Aug. 26, 2009.

Acknowledgments:

The author wishes to thank Chief Phil Roy, Coast Guard Dive Program assistant manager for sharing his wealth of knowledge and insight about helmet diving. *Proceedings* gratefully acknowledges the support of CAPT David Fish, Mr. Charles Barbee, LCDR Paul Rudick, LT Stephen Thompson, and Mr. Ken Olsen, U.S. Coast Guard Office of Investigations and Casualty Analysis.

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Lessons Learned

from **USCG Casualty Investigations**

The Point of No Return

Loss of propulsion leads to allision.

by MS. KRISTA REDDINGTON
Technical Writer

On the afternoon of December 14, 1996, the M/V *Bright Field* was traveling down-bound on the Mississippi River when it experienced an automatic “trip” of the main engine, resulting in a loss of power and steering. Unable to restore power, the crew was helpless to prevent the vessel from alliding with the Poydras Street wharf near the Riverwalk shopping mall in New Orleans, La., causing damage to several pierside structures and sending surge waves downriver, which struck two passenger vessels that were readying for evening cruises.

Fortunately, there were no fatalities. However, more than 60 people were injured as they were shaken from gangplanks or trampled by other terrified passengers. Repairs to the vessel, estimated around \$1.8 million, were limited to the hull, port, and starboard bows and the bulbous bow and required 180,000 pounds of steel. The vessel sustained several punctures and gashes, as well as some internal frame and bracket damage that penetrated the No. 1 hold.

The pier sustained damages including a collapse of about 350 feet of the open pier. Part of the adjacent condominium and garage structures also suffered damage, as did several rooms in the Hilton Hotel and several of the shops in the riverside mall.¹

Main Engine Systems

Operation of the vessel’s main engine was fully automated, so the full range of control functions, such as speed, start, stop, reverse, etc., could be controlled from the bridge. The vessel was equipped with a monitoring and alarm system that was integrated with the main engine control system and the vital auxiliary sys-

tems. The control and monitoring systems provided a level of automation to allow the vessel to operate with a periodically unattended engine room.

The main engine lubricating system was designed so that only one each of the two main and two crosshead lubricating oil pumps needed to be running at any given time. The other pump provided a backup should the primary pump experience difficulties or cease to function.

The main engine was equipped with an emergency trip system that could be affected in one of three ways:

- **Manual trip** – in the event that the main engine could not be stopped, the operator could press the “emergency stop” button at the bridge or engine control room;
- **Overspeed trip** – an automatic shutdown of the main engine once the RPM exceeds a pre-set limit;
- **Automatic trip** – the main engine would automatically stop when certain systems dropped below a preset level.

An automatic slow down could be overridden by the bridge or engine control room by pressing the “automatic slow down override” button. The main engine, however, could not be operated through the full range of speed without the correction of the condition that caused the automatic slow down.

A Timeline to Tragedy

On November 21, 1996, the vessel and its Chinese crew entered the Mississippi River and moored at a facility in Davant, La., to discharge its cargo of coal. Over the next

couple of weeks, the vessel's holds were cleaned and prepared for the next cargo of grain as the engineers and a representative from the vessel's diesel engine manufacturer made some repairs to the main engine in preparation for the return to sea.

Repairs to the main engine were completed on December 13 and, at 7:30 a.m. on December 14, the assigned pilot received notice that the vessel was scheduled to depart the LaPlace Anchorage at 10:30 a.m. to go to sea. The master notified the chief engineer that the pilot was scheduled to board the vessel a half hour before departure.

Preliminary Engine Tests

The chief engineer, second engineer, and fourth engineer began to prepare the main engine to get underway by testing the main engine auxiliary pumps, the main and crosshead lubricating oil pumps, and the salt- and freshwater cooling pumps. The third mate, scheduled to stand the 8:00 a.m.-noon bridge watch, began testing equipment and systems shortly after he began his duty watch. He advised the engine room to prepare the engine for departure and synchronize the engine room clock with the bridge clock before turning on the navigational equipment.

After testing the steering gear from the bridge with the assistance of the electrician testing it from the steering gear room, the third mate conducted a lamp test on the bridge's engine control console to test for burned-out bulbs. Together with the engineers, the third mate completed his check by testing the engine order telegraph in all positions ranging from "navigation full ahead" to "emergency full astern." With the steering gear, navigation, and emergency systems tests concluded, all pre-departure tests were logged as having been completed.

Around the same time the third mate was conducting his testing, the engineer was following similar procedures in the engine room. After completing the synchronized testing of the steering gear, he conducted a lamp test of the lights on the engine room console to check for burned-out bulbs. He did not perform the lamp test on the bridge console because he had conducted a similar test the previous day; both consoles had lights in good working order. The engineer then tested the vessel's internal communications and the main generator switchboard. He did not perform any functional testing of the automation system or the main or crosshead lubricating oil pumps. The engineer completed his tests around 10 a.m.

Pilot Observation

Having arrived aboard the vessel by 10:40 a.m., the pilot observed that the vessel had no severe list or trim and the stern draft marks stood at 12.06 meters (39.57 feet). After being escorted to the bridge and introduced to the master, the two engaged in a brief discussion of the vessel's equipment, and the pilot familiarized himself with the bridge.

According to the investigation report, this discussion did not include a review of methods or procedures for bridge management of pilot-crew communications in the event of emergencies or a review of the draft, maneuvering characteristics, and vessel particulars and peculiarities as required by the Code of Federal Regulations. The pilot glimpsed the vessel particulars and maneuvering information as it was posted on the bridge but later testified that he did not adequately review the information on the vessel's propulsion plant, the stated maneuvering, or stopping performances prior to getting underway.

Just before 11 a.m., the pilot and master began to maneuver the vessel in order to raise the port and starboard anchors. The engine was set to run on marine diesel oil and was under bridge control. The maneuvering lever was moved from "stop" to "dead ahead slow" to start the engine; however, the engine failed to start, though no start failure alarm sounded. Control of the engine was transferred to the engine room and the engineers on watch were able to successfully start the main engine. Control was transferred back to the bridge and the port anchor was raised.

The First Failure

Within minutes, the engine had stopped. Again, there was no start failure alarm, and the bridge was unable to restart it. Engine control was switched back to the engine room and the engine was started once more. Following this second failed start attempt, the main engine remained under control of the engine room for the following 20 minutes. Later the chief engineer would testify that the probable source of the problem was a fuel oil control valve that was not opening properly.

In compliance with the operator's policy of having engineers on watch while the vessel is maneuvering on restricted waters, the chief engineer, electrician, and oiler remained in the engine room once the vessel had gotten underway. Though the second engineer was not on watch, he also remained in the engine room. Other non-licensed personnel also remained in the engine



room though they had no watchstanding responsibilities at the time.

Alarms Sound the Warning

Shortly after 11 a.m., both anchors were raised and held in place only by the friction brake so that they were ready for immediate release, and the vessel got underway from LaPlace Anchorage. The vessel proceeded downriver at “maneuvering full ahead,” yet the pilot remained unaware that the engine control remained with the engine room.

During the downriver transit, five people were manning the bridge: the pilot, the master, the helmsman, the mate on watch, and a relief helmsman/lookout. At 11:30 a.m., control of the main engine was returned to the bridge and the pilot ordered “navigation full ahead.” Minutes later, the engineers switched the fuel system to run the main engine on heavy fuel oil.

Over the course of half an hour, an alarm in the engine room—indicating a high differential pressure across the second filter in the main engine lubricating system—sounded four times. During the first occurrence, the differential pressure remained above the alarm set point for 23 minutes. In each of the following three occurrences, the differential pressure dropped and the alarms cleared within two minutes. There is no indication that either the master or pilot was notified of any of these alarms.

Just before noon, a high temperature alarm sounded indicating that all five cooling water cylinders had reached the set point of 90° C. The alarm did not sound on the bridge despite the classification society’s rules that an audible alarm is required to sound for this condition. Again, there is no evidence suggesting that the master or pilot were informed of these alarms. The master ordered the vessel’s speed reduced to “maneuvering full ahead” at 11:59 a.m. At the same time, the alarm condition cleared when the cooling water temperature dropped below the alarm point.

Alarms Continue

At noon, several crewmembers reported for their watch periods. While the second mate relieved the third mate, the third engineer was relieving the fourth engineer in the engine control room and testified that he did not see anything unusual in the control room. He stated that the No. 1 main engine lubricating oil pump run indicator light was lit and the No. 2 main engine lubricating oil pump was on standby. The pilot, dissatisfied by the response of the vessel to helm commands at the

reduced speed, ordered the vessel back to “navigation full ahead” at 12:25 p.m.

As with the previous alarms, neither the master nor pilot was informed.

The chief engineer, second engineer, and third engineer left the engine control room to investigate the cause of several alarms that sounded between 12:35 and 12:37 p.m. The cooling fresh water alarms for the main engine cylinders had sounded again, as had the scavenging air high-temperature alarm.

The second engineer discovered that the flow of sea water had been restricted by a stuck overboard valve on the main engine cooling sea water system. The engineers adjusted the valve handle to correct the problem, allowing the temperatures in the cooling fresh water and scavenging air systems to drop, thereby clearing the alarms.

Within minutes of the cooling fresh water and scavenging air systems alarms being cleared, an alarm sounded three times indicating low pressure in the main engine cooling sea water systems. The alarm sounded again shortly after 1 p.m., but for the remainder of the voyage, the main engine cooling sea water system operated below the alarm set point. As was the case with the previous alarms, there is no indication that the master or pilot was informed.

As the alarms were sounding, the electrician began his inspection of the engine and steering gear rooms and found all equipment to be operating normally. Following the inspection, which took about an hour, he returned to the engine room. At that time, alarms indicating an abnormal condition on the No. 1 lubricating oil purifier sounded. Both alarms cleared within a minute as the No. 1 purifier, used to clean the oil in the main engine lubricating oil sump, quickly returned to normal condition.

A Near Miss

The master dispatched the carpenter to stand by the anchors, where he remained for the remainder of the voyage. Shortly after passing under the Huey P. Long Bridge, the pilot established a starboard-to-starboard meeting agreement with three upbound vessels. The

first meeting with a deep-draft vessel was completed without incident. The second meeting was with a tug and tow that was supposed to continue transiting near the right descending bank while in Carrollton Bend.

The tug operator was unable to maintain the tow in the agreed-upon position, however, and the tow moved toward the middle of the navigable section of the river. As the projected path would have resulted in a collision, the pilot delayed the start of his turn at Algiers Point to avoid it. After meeting with the tug in a close quarters starboard-to-starboard encounter in the bend, the pilot ordered the rudder full to starboard and sounded the danger signal as the vessel passed close to a barge fleet moored on the left descending bank in Carrollton Bend.

Having safely cleared the barge fleet, the vessel completed the third meeting without further incident. Just before 2 p.m., the pilot contacted the Gretna Tower light operator to identify the vessel and discuss the intended transit through the port.

Warnings

The report log printed by the engineering alarm and monitoring system at 2 p.m. showed that all systems relating to the main engine were within normal limits except that of the main engine sea water cooling system, which was recorded slightly below the alarm set point. Six minutes later, an alarm indicating that the main engine had automatically tripped because the lubricating oil pressure was low sounded in the engine control room.

Almost immediately, the vessel began to slow, and the bridge crew felt a reduction in the engine vibration through the deck. The engine speed significantly decreased from 72 rpm to 30 rpm.

The master and second mate examined the bridge console to try to determine the cause of the slow down. Though the pilot asked the master, "Do we have a problem?" the master did not answer, instead instructing the second mate, in Chinese, to contact the engine control room to find out what happened and have the speed of the vessel increased immediately.

The chief engineer answered the call and informed the second mate that there had been a sudden drop in pressure in the lubricating oil pump, though he did not know why. The two agreed that engine control would be transferred from the bridge to the engine control room, but the second mate did not inform the chief engineer of the severity of the maneuvering situation.

"Do we have a problem?"

Within ten seconds, the second mate acknowledged the transfer of engine control to the engine room; however, this information was never conveyed to the pilot.

As the vessel continued at the slowed pace, the pilot informed the Governor Nicholls light operator, referred to as "Governor Nick," that the vessel had lost engine power and requested that everyone in the harbor be alerted to the situation. Noticing the bow veering to port as the vessel passed under the Crescent City Connection Bridges, the pilot immediately tried to counter the swing by ordering the rudder put hard to starboard.

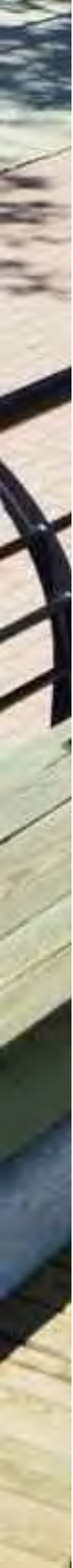
The Governor Nicholls light operator had begun to broadcast warnings to all vessels occupying the harbor, contacted Marine Safety Office New Orleans, and requested tug assistance for the incoming vessel. As the vessel cleared the downriver span of the Crescent City Connection Bridges, the pilot advised the light operator that they were on a collision course with the gambling boat *Queen of New Orleans* and requested that it be warned.

Miscommunication

The vessel continued the slow swing to port and the pilot gave the master the order to stand by to let go anchors. The master later testified that the order was "let go anchors" and he had attempted to relay the order to the carpenter, on the bow, via hand-held radio.

Before the master was able to convey the order, the pilot began to sound the danger signal. The pilot was manually sounding the warning using the button that operated the forward whistle, and the noise rendered communication by hand-held radio ineffective. The master went out to the bridge wing in an unsuccessful attempt to physically attract the carpenter's attention. The vessel continued on its collision course, now headed for a clear section of waterfront between deep draft passenger vessels, a casino ship, and an excursion vessel.

The master and pilot both realized that they did not have enough time or distance to be able to regain full control of the vessel and an allision was now inevitable. As noted in the investigation report, the pilot broadcast "Governor Nick, this looks bad. Tell those people to get away! There's people on the dock! Tell those people to get away!"



**"Governor Nick, this looks bad.
Tell those people to get away!"**

The pilot ordered the port anchor released; an order that the master was finally able to relay to the carpenter through the hand-held radio. The order from the pilot for "full astern" was relayed to the engine control room by the second mate and recorded in the bridge bell log at 2:09 p.m.

The master, re-evaluating the situation, realized that dropping the port anchor could cause the vessel to swing to port and strike passenger vessels. In Chinese, he rescinded the order to let go the port anchor before the carpenter could act on it. The pilot was not advised of this action. The second mate testified that approximately 15 seconds after the "full astern" order was given, the bridge rpm indicators began to show astern revolutions that increased from 35 to 55 rpm just prior to the allision.

The deck vibrated with the power of the propeller turning in reverse as the vessel continued to approach the river walk and the master again ordered the carpenter to let go the port anchor. The carpenter loosened the port windlass friction brake two turns and then ran aft along the starboard side. He testified that easing the crank two turns was usually enough to enable the anchor to fall by force of gravity while still making the brake somewhat effective. A videotape of the allision showed the port anchor still hanging above the surface of the water as the vessel struck the pier. When the vessel made contact with the pier, the port anchor and chain began to pay out.

The Allision

At 2:10 p.m., the vessel struck the river walk at an approximate angle of 45 degrees and continued to slide along the structure until it came to rest parallel to the pier. As the vessel raked along the pier, its bow came upon an area of shallower water and the first 70 feet of the vessel came to rest aground. Once the vessel stopped moving, the pilot ordered the engine stopped. The pilot and master both reported that they had not heard any engineering alarms on the bridge during the time from the loss of propulsion to the allision.

The tug *Mississippi* had been down-bound close behind the errant vessel and responded to the calls for assistance made when the cargo vessel lost propulsion. There was minimal difference in speed between the vessels, and the tug did not reach the vessel until after the allision. The tug and as many as eight other tugs helped to hold the grounded vessel in place until it could be moored securely to the remains of the pier to prevent further damage. Even if the tug had reached the scene in time, three senior pilots who later testified before the marine board agreed that, at the speed that the vessel was traveling prior to loss of propulsion, conventional tugs could not have brought it under control.

The ill-fated vessel remained held adjacent to the pier until January 6, 1997, when emergency bracing repairs to the wharf were completed and the vessel could be safely moved.

A Tragedy of Errors

The chief engineer testified before the Marine Board that he had placed the No. 1 pumps of the main engine auxiliary, main and crosshead lubricating oil, and salt and freshwater cooling systems online while placing the No. 2 pumps in standby mode. A technician performing repairs, reprogramming, and tests of the automation system installed on the bulk carrier testified that the main engine had tripped instead of going into automatic slowdown as a result of the loss of lubricating oil pressure to the main bearings. He stated that when a main lubricating oil pump starts automatically due to abnormal conditions, it is recorded on the alarm log. A review of the alarm log showed that the No. 2 main engine lubricating oil pump did not start automatically.

The technician revealed that the chief engineer had admitted to him that the No. 2 main engine lubricating oil pump had been left in manual mode. This made it impossible for the motor controller to automatically start the No. 2 pump in the event that the main engine lubricating oil pressure became too low. However, the chief engineer testified that the No. 2 main engine lubricating oil pump had been in standby mode, and that the automatic slowdown indicator light had lit at the time the loss of propulsion occurred.

Investigation Reveals Deficiencies

Tests conducted on the master, pilot, all officers and crew on watch, and the light operators on duty at the time of the incident showed that drugs and alcohol were not factors in the casualty. The master, pilot, and

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In the Line of Fire

As the out-of-control vessel was approaching the pier, four other vessels were moored in close proximity to the impending point of impact.

Vessels Moored Upstream Suffer No Damage

The *Enchanted Isle*, a sea-going cruise ship, was moored starboard side to the Erato Street Wharf and was located the farthest upstream. The vessel's master and third officer were on the bridge and heard the danger signals.

While the master recognized that the approaching ship was in trouble, he could tell that, based on its position and relative motion, his ship was not in danger. Though *Enchanted Isle* had approximately 200 passengers aboard, there was no general announcement made. The crew was ordered to man mooring and gangway positions, secure the gangway, and proceed to the stern to monitor the situation. About a minute after the allision occurred, a surge wave reached the passenger vessel but caused no damage or injuries, requiring only that the crew readjust the mooring lines, reopen the gangway, and resume the boardings that had been interrupted.

The *Niuew Amsterdam*, another sea-going passenger vessel, was moored starboard side to the Julia Street Wharf, downstream from the *Enchanted Isle*. The master, having heard the danger signals, ordered the gangway secured and directed crewmembers to evacuate all passengers from the vessel's stern as he continued to monitor the situation. No warnings were broadcast to passengers and watertight doors remained open. The cargo vessel passed about 150 feet astern of the passenger vessel and the surge wave caused no

damage or injuries. When the situation was deemed safe, normal operations and passenger boardings resumed.

Casino Ship Evacuates, Dozens Injured in Panic

The four-level casino ship *Queen of New Orleans* was moored starboard side to the pier with its bow pointing upstream. At the time of the casualty, 637 people were aboard. The entry and exit point for passengers funnels through a control point at a 12-foot-wide fixed gangway, which is installed on a pier with a short ramp that serves as a bridge between the gangway and the vessel.

The mate on watch had been monitoring VHF-FM channel 67 and called the master to the bridge when he heard the warnings. The master had been on the main deck and saw the bulk carrier approaching as he made his way to the bridge. He realized that the casino ship was in danger and, after ordering an immediate evacuation, he ordered the engines started and preparations made to get underway. With only approximately three minutes to evacuate everyone aboard and approximately 446 people, roughly 70 percent, were evacuated before the cargo vessel allided with the pier.

During the evacuation, several people panicked; one woman jumped from the second level of the ship to the dock, breaking her pelvis and injuring her hips, legs, and back. An employee on the vessel also jumped from the gangway to the pier, injuring her neck and back. Of the 35 re-

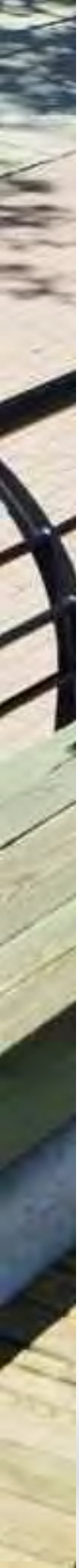
ported injuries, 22 were passengers and 13 were members of the crew. Almost all of the injuries resulted from pushing and shoving by panicked passengers and crew who were attempting to reach shore.

Excursion Vessel Swamped, Three Fall Overboard

The *Creole Queen*, an excursion vessel, had just gotten underway from its berth at the Poydras Street Wharf with a passenger and crew count of 190 people. Because the vessel had been moored behind the *Queen of New Orleans*, the master could not directly observe the ship approach.

The master had been monitoring VHF-FM channel 67 and, hearing the warnings, ordered his vessel back to the pier where it was moored starboard side with its bow pointing upstream. He sounded the general alarm and ordered all passengers and crew to evacuate. The crew positioned the gangway and evacuated about half of the people before the surge wave reached the *Creole Queen* approximately one minute and ten seconds after the massive ship allided with the river walk.

The force of the wave caused the vessel to heave from the pier, shifting the gangway and causing three passengers to fall through the gap between the vessel and the piers. Two were able to climb a rescue ladder back to the deck; however, the third sustained a hip fracture that required him to be lifted in a rescue litter.



chief engineer all testified that they were not taking any medications or suffering from illness, and were well rested at the time that the incident occurred.

Tests conducted by the Coast Guard on December 15 showed both main lubricating oil pumps online and running. The representative for the vessel's owner confirmed that this was the condition of the pumps at the time of the allision. It was observed that the No. 1 lubricating oil pump was noisy and vibrating. After leaving the pumps to run, the Coast Guard inspector returned the next day to find that the No. 1 pump was still vibrating noisily. The same day, pressure tests were conducted on both lubricating oil pumps by running and then manually securing one of the pumps in order to test the remaining pumps ability to maintain adequate lubricating oil pressure.

When the No. 2 lubricating oil pressure pump was secured, the No. 1 pump was unable to provide enough pressure and an alarm sequence unlike that recorded on December 14 was recorded by the alarm and monitoring system. When the same test was performed on the No. 2 pump, it provided the necessary pressure and no alarms were recorded.

Further tests conducted in the first weeks of January 1997 revealed that the lubricating oil pressure reading for the alarm and monitoring system was higher than that shown on the pressure gauges on the engine control room console and on the engine side panel. Only days after the tests had revealed this contradiction, the display on the monitor showed to be consistent with gauges, indicating that someone had corrected the problem. On January 6, the Coast Guard inspector observed a successful test in which the standby main lubricating oil pump automatically started in response to a loss of lubricating oil pressure; however, the start came at a point well below the set pressure required for an automatic start.

The pressure switch, which initiates the automatic start, had been adjusted since the original January 4 tests. One of the main contributing factors in the casualty was the No. 2 main engine lubricating oil pump having been left in manual mode; however, even if this pump had been placed in standby, the possibility remains that it would have failed to start automatically based on the testing of the pressure switch.

The erroneous reports that were printed during a January 21 testing were not repeated on a test conducted

the following week. Whether the correction occurred due to replacing the pressure switch, reprogramming the system, or for some other reason is unknown.

The investigation determined that the No. 1 lubricating oil purifier was dirty and packed with particulates. It was also found that the bottom of the lubricating oil sump contained emulsified oil/water mousse and about three-eighths of an inch of sediment. The Coast Guard found evidence that the chief engineer failed to clean the main engine sump and did not maintain an adequate amount of lubricating oil in the same.

It was also found that the previous chief engineer may have lacked the experience and training necessary to properly maintain the vessel's main engine and failed to maintain a sufficient amount of lubricating oil in the main engine sump. It is evident that if the vessel had been navigating with both main engine lubricating oil pumps operating properly and simultaneously, the main engine would have been unlikely to experience an automatic trip.

The Finding

Coast Guard investigators determined that the loss of main engine lubricating oil pressure to the main bearings, resulting in the main engine loss, causing the loss of propulsion and steering, was the immediate cause of the casualty. The sequence of rpm loss, hard right rudder, and full astern propeller reduced the water flow over the rudder, creating a hydrodynamic stall that prevented the master and pilot from regaining positive control of the vessel.

Based on the loss of lubricating oil pressure to the main bearings that directly contributed to the main engine trip, it was determined that there was no action that could have been taken by the master or chief engineer that would have by-passed the main engine trip and maintained propulsion.

Communication Is Key

One of the main contributing factors in this casualty was the lack of communication by the crew. It was reported that the vessel's onboard telephone system was in normal mode for use in communications between the bridge and the engine control room. There was no testimony of any difficulties in using the telephone system; however, the alarms encountered by the engine control room were never conveyed to the bridge, and the master and pilot remained unaware of their occurrence.

The pilot had been aware of the potential for difficulties in communications because the primary language of the crew was not English. To avoid any miscommunications, he used a simplified vocabulary and spoke clearly and slowly and reported that the helmsman and mate-on-watch repeated helm and engine commands twice; once to acknowledge the order and the second time to report completion.

Though the pilot strived to ensure his commands were understood, the bridge crew's communication was less effective in keeping the pilot aware of actions that directly affected the navigation of the vessel. In cases such as transferring main engine control between the bridge and the engine control room and the master's instructions to the chief engineer following the loss of propulsion, which were conveyed in Chinese, the pilot was not kept abreast of the happenings on the vessel.

Those at Fault

The investigation report included a recommendation that the Republic of Liberia conduct a suspension and revocation investigation of the vessel's licensed engineers for misconduct and negligence as they failed to properly maintain an adequate level of lubricating oil in the main engine sump, failed to set the No. 2 main engine lubricating oil pump for automatic operation, and provided false sworn testimony before the Marine Board.

It was also recommended that the vessel's prior chief engineer be investigated for negligence and/or incompetence for failing to keep the vessel's main engine in sufficient condition and for failure to maintain an adequate volume of lubricating oil in the main engine sump.

Response and Recommendations

In response to a Congressional directive in 1997, the Commandant of the Coast Guard directed the establishment of the Ports and Waterways Safety System, designed to reduce the number of vessel casualties in busy ports and waterways. By providing real-time data on traffic conditions, the system would be based on automated identification system technology that requires transponders aboard vessels to collect and transmit information on the ship's speed, location, and direction.

The chief engineer transferred engine control to the engine room without informing the pilot.

The Lower Mississippi River Waterways Safety Advisory Committee, made up of local government and marine industry members, was formed to develop baseline system requirements for a vessel traffic service (VTS) on the lower Mississippi River. The committee delivered a comprehensive report, recommending user requirements and system capabilities based on user information needs, to the commander of the Eighth Coast Guard District in April 1997. Based on these recommendations, a newly formed VTS task force helped to design and provide input on a transponder-based VTS system on the lower Mississippi River. The system allows transiting vessels to make position reports to a vessel traffic center by radio telephone and enables them to receive accurate, complete, and timely navigational safety information.

Additionally, in March 1997, the captain of the Port of New Orleans and the board of commissioners of the Port of New Orleans signed the Riverfront Alert Network into effect. The network is an emergency radio alerting communications system that is installed at the Governor Nicholls Vessel Traffic Light control tower, the Port of New Orleans Harbor Police Third Street Station, and at crucial property locations around the port. In the event of another vessel emergency in the vicinity, this system will alert the harbor police and property tenants.

Acknowledgments:

Proceedings gratefully acknowledges the support of CAPT David Fish, Mr. Charles Barbee, LCDR Paul Rudick, LT Stephen Thompson, and Mr. Ken Olsen, U.S. Coast Guard Office of Investigations and Casualty Analysis.

About the author:

Ms. Krista Reddington most recently worked as a technical writer in the Office of Standards and Evaluation at U.S. Coast Guard headquarters. Before writing for the Coast Guard, she was a government affairs associate for the American Waterways Operators, and she has also worked for Xantic, an international satellite telecommunications company.

Endnote:

¹ No injuries to persons inside or near these structures are noted in the marine board report.



Understanding Urea

by MR. THOMAS B. JORDAN

U.S. Coast Guard Hazardous Materials Standards Division

What is it?

Urea is a highly effective nitrogen-based fertilizer, more commonly used than ammonium nitrate. Since ammonium nitrate is highly explosive, it's often mixed with urea to reduce its explosive potential.

How is it shipped?

Urea can be shipped either as solid granules (frequently mixed with ammonium nitrate and/or ammonium sulfate), or in solution. Since solid urea is hygroscopic (it attracts moisture), it needs to be sealed in an air-tight container to protect its integrity. Solid urea can be transported by truck, train, barge, or ship. Urea solution can be transported by tanker truck, barge, or ship without extraordinary considerations other than compatibility issues.

Why should I care?

► Shipping concerns.

Urea solution is classified as a "category Z"¹ chemical, which means that it presents a minor hazard to either marine resources or human health.

The release of large quantities of urea into an aquatic environment can cause algae blooms. High concentrations of algae release toxic chemicals into the water that could kill aquatic life in the surrounding area.

► Health concerns.

Urea can irritate skin, eyes, and the respiratory tract. Ingestion can cause nausea, vomiting, diarrhea, headache, confusion, and electrolytic depletion as it is absorbed into the bloodstream. Inhaling urea dust causes trouble breathing and symptoms similar to ingestion. Chronic exposure to urea dust has been found to cause weight loss, emphysema, and metabolism disturbances.

When urea is dissolved in water, it forms an ammonia solution. Inhaling ammonia vapors will cause coughing and difficulty breathing. Longer exposures to such vapors can damage the lungs.

Workers must use gloves and goggles while handling urea, and must wear proper respiratory equipment if work area concentrations of urea exceed 10mg/m³.

► Fire or explosion concerns.

Urea itself is not normally flammable or explosive, but it is incompatible with a number of chemicals such as bleach and oxidizing agents. When these are combined, the chemical reactions tend to be rather vigorous and exothermic, so much so that an explosion may easily occur under the right circumstances. Even if this does not occur, the chemical compounds formed as products of those reactions, such as urea nitrate or nitrogen trichloride, are frequently highly explosive.

What is the Coast Guard doing about it?

The Coast Guard is leading the working group on Annex VI to the International Convention for the Prevention of Pollution from Ships, which deals with air pollution emitted by ships. Urea is a key component to selective catalytic reduction exhaust scrubbing systems on ocean-going vessels. Urea solution is injected into the exhaust gases, which are then passed over a catalyst to form harmless diatomic nitrogen, water, and carbon dioxide.

About the author:

Mr. Thomas B. Jordan is a sophomore at the University of Maryland, College Park, and is pursuing a major in chemical engineering. He was an intern in the Hazardous Materials Standards Division at U.S. Coast Guard headquarters.

Endnote:

¹ International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code), 2007 edition.

Nautical Engineering Queries

Prepared by NMC Engineering Examination Team



1. When the current in a power transmission line is increased, the power loss _____.
 - A. increases as the square of the current
 - B. decreases as the square root of the current
 - C. remains the same, as it is independent of current flow
 - D. increases in direct proportion to the current

2. The purpose of the delivery check used in a diesel fuel injection jerk pump is to _____.
 - I. assist in quick cutoff of fuel injection
 - II. prevent fuel oil backflow from the injection pump
 - A. I only
 - B. II only
 - C. both I and II
 - D. neither I nor II

3. A journal rotating in its bearing relies on hydrodynamic principles for lubrication. Under steady load conditions, the journal rotating in the bearing will assume a position _____.
 - A. at bearing bottom center
 - B. concentric in the bearing
 - C. at bearing top center
 - D. eccentric in the bearing

4. One function of a replenishing pump installed in many pressure-closed hydraulic systems is to supply fluid flow to _____.
 - A. the reservoir
 - B. a servo control circuit
 - C. position a manually controlled valve
 - D. the main system accumulators under all operating conditions



1. *Note: The power loss in a power transmission line is a function of the product of the current flowing through the power line and the voltage drop across the power line according to the power formula $P = I \times E$. The voltage drop is the product of the current flowing through the power line and the power line resistance according to Ohm's Law $E = I \times R$. By substituting $I \times R$ for E in the power formula, the power formula can be rewritten as $P = I \times I \times R$ or simply $P = I^2 \times R$. Since the power line resistance is fixed, the power loss is a function of the square of the current. If the current increases, the power loss will increase by the current squared. If the current decreases, the power loss will decrease by the current squared.*
 - A. increases as the square of the current **Correct answer. See note above. If the current in a power transmission line is increased, the power loss will increase as the square of the current ($P = I^2 \times R$).**
 - B. decreases as the square root of the current **Incorrect answer. Regardless of whether the power line current increases or decreases, the power loss is a function of the square of the current.**
 - C. remains the same, as it is independent of current flow **Incorrect answer. See note above. Power loss is not independent of current flow and the power loss will increase, not remain the same.**
 - D. increases in direct proportion to the current **Incorrect answer. Power loss will increase, but not in direct proportion to the current. The power loss will increase as the square of the current.**

2. *Note: Plunger-type fuel injection pumps incorporate a fuel delivery check valve situated between the top of the pump housing and the high-pressure fuel line leading to the injector nozzle. For the purposes of this discussion, it will be assumed that the port and helix metering principle is used. When seated, the area of exposure to the fuel pressure above the fuel injection pump plunger is relatively small. The rapid buildup in pressure that occurs when supply and spill valve ports are closed and the plunger is moving upward becomes sufficiently high in pressure to overcome the delivery spring valve compression allowing the delivery valve to open and begin injection. Once the delivery valve opens, the area of exposure is significantly increased, which requires a significant drop in fuel pressure in order for the delivery valve to reseal. This rapid drop in pressure will occur when the spill port opens as a result of the plunger moving still higher. The closing spring force is much stronger than the now relatively low fuel pressure, resulting in very rapid cutoff (ending) of fuel injection. The delivery valve also functions as a check valve preventing the backflow of fuel from the high-pressure fuel line back into the pump housing, thus keeping the high-pressure fuel line full of fuel.*
 - A. I only **Correct answer. See note above. The delivery check valve does cause a quick cut-off of fuel injection, but does not prevent backflow of fuel from the injection pump.**
 - B. II only **Incorrect answer. The delivery check valve prevents the backflow of fuel from the high-pressure fuel line into the fuel injection pump, but does not prevent backflow of fuel from the injection pump.**
 - C. both I and II **Incorrect answer. Choice "A" is the only correct answer.**
 - D. neither I nor II **Incorrect answer. Choice "A" is the only correct answer.**

3. *Note: Hydrodynamic lubrication is obtained by interposing a sufficiently thick film of lubricant between a journal and bearing to prevent metal-to-metal contact. The journal must be rotating at a certain speed for hydrodynamic lubrication to take place. When rotation begins, the journal moves up the bearing bore until an equilibrium condition exists where the journal is supported by a wedge of oil. The journal is held away from the bearing surface by the pressure generated within the fluid film. The actual position of the rotating journal to the bearing depends on the load and speed.*
 - A. at bearing bottom center **Incorrect answer. When the journal is under a heavy load, it will attempt to assume a position at or near the bearing bottom center.**
 - B. concentric in the bearing **Incorrect answer. For hydrodynamic lubrication to take place, the surfaces between which the fluid film moves must be eccentric. Concentricity would result in an equidistant clearance space between the journal and bearing, which would prevent the formation of a wedge of oil necessary for lubrication. See explanation for Choice "D."**
 - C. at bearing top center **Incorrect answer. Under high speed and light load conditions, the rotating journal will attempt to assume a position at or near bearing top center.**
 - D. eccentric in the bearing **Correct answer. Eccentricity is the distance between the center of the journal and the center of the bearing. The eccentric relation between the two allows the clearance space between them to assume the shape of a crescent, which is necessary for the formation of the wedge of oil to hold the journal away from the bearing.**

4. *Note: Open-loop hydraulic systems feature a single unidirectional pump, which has a designated suction port that is connected to the reservoir. This is typically the only pump provided. If a leak occurs anywhere in the system, the pump will function to keep the system filled as long as enough fluid remains in the reservoir. Closed-loop hydraulic systems feature two pumps: a power pump and a replenishing pump. The power pump is a bi-directional pump, which is typically a servo-controlled variable displacement pump. This replenishing pump (usually driven by the same motor driving the power pump) functions to keep the system filled should a leak develop in the system.*
 - A. the reservoir **Incorrect answer. The replenishing pump actually draws suction on the reservoir and discharges into the closed-loop (on either side) through check valves to replenish the system should a leak occur. If the reservoir requires make-up fluid, a make-up transfer pump is used for this purpose.**
 - B. a servo control circuit **Correct answer. As the name implies, the replenishing pump replenishes the system as needed. However, it also functions to place the power pump on stroke via the servo control circuit, as the replenishing pump is the only source of hydraulic pressure with the power pump off stroke.**
 - C. position a manually controlled valve **Incorrect answer. In a system with a manually controlled valve, the positioning of such a valve is done manually, not with a replenishing pump.**
 - D. the main system accumulators under all operating conditions **Incorrect answer. The main system accumulators, where used, are generally used in open-loop hydraulic systems and would be teed off the pump discharge line. Alternatively, they may be connected to either side of the hydraulic actuator.**

Nautical Deck Queries

*Prepared by NMC Deck
Examination Team*

Q

uestions

1. On a vessel of 125,000 GT on an international voyage, how many international shore connection flange(s) must be provided?
 - A. 1
 - B. 2
 - C. 3
 - D. 4

2. INLAND ONLY Which statement is TRUE concerning narrow channels?
 - A. You should keep to the side of the channel that is on your port side.
 - B. You should avoid anchoring in a narrow channel.
 - C. A vessel having a following current will propose the manner of passage in any case where two vessels are meeting.
 - D. All of the above.

3. In time of war, naval control of shipping authorities may give orders concerning the_____.
 - A. cargo to be loaded
 - B. final destination
 - C. ship's route
 - D. all of the above

4. Which statement is true concerning the placard entitled "Discharge of Oil Prohibited"?
 - A. It is required on all vessels.
 - B. It may be located in a conspicuous place in the wheelhouse.
 - C. It may be located at the bilge and ballast pump control station.
 - D. All of the above.

1. A. 1 Correct answer. One shore connection must be available *to* each side of the vessel, not one connection *on* each side. On an international voyage there must be one international shore connection provided that can be available for use on either side of the vessel:
46 CFR 95.10-10(c): "On vessels of 500 gross tons and over there must be at least one shore connection to the fire main available to each side of the vessel in an accessible location. Suitable cut-out valves and check valves must be provided. Suitable adapters also must be provided for furnishing the vessel's shore connections with couplings mating those on the shore fire lines. Vessels of 500 gross tons and over on an international voyage must be provided with at least one international shore connection complying with ASTM F 1121 (incorporated by reference, see §95.01-2). Facilities must be available enabling an international connection to be used on either side of the vessel."
- B. 2 Incorrect answer.
- C. 3 Incorrect answer.
- D. 4 Incorrect answer.

2. A. You should keep to the side of the channel that is on your port side.
Incorrect answer. As per Rule 9(a(ii)), a vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable.
- B. You should avoid anchoring in a narrow channel.
Correct answer. As per Rule 9(g), every vessel shall, if the circumstances of the case admit, avoid anchoring in a narrow channel.
- C. A vessel having a following current will propose the manner of passage in any case where two vessels are meeting.
Incorrect answer. As per Rule 34(a), when power-driven vessels are in sight of one another and meeting or crossing at a distance within half a mile of each other, each vessel underway, when maneuvering as authorized or required by these rules ... (see (i) and (ii) for specific signals).
- D. All of the above.
Incorrect answer.

3. A. cargo to be loaded Incorrect answer.
- B. final destination Incorrect answer.
- C. ship's route Correct answer. From Pub 117, Radio Navigation Aids: "In periods of crisis, conflict, national emergency, or war, naval authorities may direct the movement of merchant ships (including routing and diversion) so that they may be better protected from hostilities and not interfere with possible naval and / or joint military operations."
- D. all of the above Incorrect answer.

4. A. It is required on all vessels. Incorrect answer.
- B. It may be located in a conspicuous place in the wheelhouse. Incorrect answer.
- C. It may be located at the bilge and ballast pump control station.
Correct answer. As per 33 CFR 155.450, a ship, except a ship of less than 26 feet in length, must have a placard of at least 5 by 8 inches made of durable material fixed in a conspicuous place in each machinery space, or at the bilge and ballast pump control station, stating the following: "**Discharge of Oil Prohibited.**"
- D. All of the above. Incorrect answer.

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